Interface for Modbus-Communication

SUNNY WEBBOX / SC-COM Modbus® Interface

Technical Description

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1 Information on this Document

Validity

This document is valid for the SMA devices listed in chapter 9.1 “Supported SMA Devices”, p. 87. It describes the variation of the communication protocol “Modbus® Application Protocol” implemented by SMA and the associated data exchange formats for SMA devices.

This document does not include any information on the software communicating with the Modbus interface. Information on such software can be obtained from the respective software manufacturer.

Target Group

This document is for qualified employees. Only persons with corresponding qualifications are allowed to perform the tasks set forth in this document (see section 2.2 "Target Group Qualifications", p. 9).

Secondary Information

SMA documents

You can find secondary information in the download area of the corresponding branch under www.SMA-Solar.com:

Source initials	**Source**
[Sunny WebBox]	Device for monitoring of plants, SUNNY WEBBOX, user manual. Download at http://www.sma-uk.com/en_UK/products/monitoring-systems/sunny-webbox.html. On the SUNNY WEBBOX homepage, the document is in the area "Downloads -> User Manual"!
[SC-COM]	Plant monitoring, SUNNY CENTRAL COMMUNICATION CONTROLLER, operating manual. Download via http://www.sma-uk.com/en_UK/services/downloads.html. On the download page, select “Solar inverters”, your inverter type, “Operating Instructions”, “English (Worldwide)” and then the operating manual!

Other documents

You can find secondary information about the “Modbus Application Protocol“ in the Internet:

Source initials	Source
[IANA]	Internet Assigned Numbers Authority (IANA), Service Name and Transport Protocol Port Number Registry: http://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xml
[MBAP]	Modbus Application Protocol Specification V1.1b, Modbus Organization, Inc. PO Box 628 Hopkinton, MA 01748, December 2006
[Modbus Serial]	Modbus over Serial Line Specification and Implementation Guide V1.02, Modbus Organization, Inc. PO Box 628 Hopkinton, MA 01748, December 2006

Symbols

Symbol	Explanation
i	Indicates information that is important for a specific topic or objective, but is not safety-relevant.
☑	Desired result.

Typography

The following distinctions are used in this document:

Typography	Usage	Example
"light"	• Software file names	• Copy the file "usrplant.xml"
[Name]	• Link to a literature source • Data channel name	• See source [MPAP] • Requesting the plant time (UTC) [SerTm]

Nomenclature

In this document, the following terminology and abbreviations are used.

Designation	Description
ADR (DEC)	Modbus start address as decimal value
CNT (2 Bytes)	Number of assigned Modbus registers. One register contains 2 bytes.
CT	Current measuring unit: Hardware for string monitoring
Data logger	In this document, the communication devices Sunny WebBox and SC-COM are collectively designated as data loggers
Device-ID	Numerical value, which identifies a certain SMA device type, e.g. 155 = Sunny Central 250U
DT, FW, RAW, FIXn	SMA data types; see section SMA Data Types, page 25
DWORD	Data with a width of 32 bit, according to IEC 61131-3
Hex	Hexadecimal number
MBAP	Modbus Application Protocol; protocol for the Modbus from "Modbus Organization, Inc."
MPP	Abbreviation for “Maximum Power Point”
NaN	Not a number; no useable value is returned
PV plant	Abbreviation for "photovoltaic plant"
RO	Read Only; value can only be read
RW	Read/Write; value can be read and written
SCADA	Supervisory Control and Data Acquisition: Control software; this document uses SCADA as an example for a Modbus master system
SC-COM	Device designation for the Sunny Central Communication Controller
SMA fieldbus	Hardware interface for communication between SMA devices, e.g. RS485 or Ethernet. You can find information on supported communication interfaces in the data sheets of your SMA devices
SMID	Supervised Multiple Input Device: Technical system in the SMA product “Optiprotect”
SMU	String Monitoring Unit: A String Monitoring Unit recognises, in cooperation with a Sunny Central String-Monitor Controller, a reduced power or a breakdown of solar panels (Strings).
WMAX	Set active power limitation. A device can generated active power up to this limit
WORD	Data with a width of 16 bit, according to IEC 61131-3

2 Safety

2.1 Intended Use

The Modbus Application Protocol [MBAP] is designed for industrial use.

- Read and follow this documentation to ensure proper and optimum use of Modbus implementation in SMA devices.
- Keep this documentation in a convenient place for future reference.

2.2 Target Group Qualifications

The activities and settings described in this document must only be performed by qualified employees. Qualified employees must have the following skills:

- Knowledge of IP based network protocols
- Training for installation and configuration of IT systems
- Knowledge and observance of this document

Qualified employees must be allowed to modify parameters of connected devices.

2.3 Safety Instructions

Data Security in Ethernet networks

You can connect the data logger to the Internet. Note that connecting to the Internet carries the risk that unauthorized users can gain access to and manipulate your data or your plant.

Take preventive safety measures, e.g.:

- Set up a firewall
- Close unnecessary network ports
- Allow remote access only through a VPN tunnel

3 Product Description

3.1 Modbus Protocol

The Modbus Application Protocol (MBAP) is an industrial communication protocol that is currently mainly used in the solar sector for plant communication in PV power stations.

The Modbus protocol has been developed for reading data from or writing data to clearly defined data areas. The Modbus specification [MBAP] does not specify what data is within which data area; this information must be defined specifically for a device. The fixed definition for a device will be called Modbus Profile in this document. With knowledge of the Modbus Profile, a Modbus master (e.g. a SCADA system) can access the data of a Modbus slave, e.g. a Sunny WebBox.

The SMA Modbus Profile is the special Modbus Profile for SMA devices.

3.2 SMA Modbus Profile

The SMA Modbus Profile is a special Modbus Profile for SMA devices that contains definitions for all SMA devices that can be connected via Modbus. The availability of the measured values and parameters of particular SMA devices for the Modbus protocol is individually defined in the SMA Modbus Profile. An SMU (String Monitoring Unit), for example, only provides the information on the string currents, whereas an inverter, for example, provides the opportunity to call up power and voltage.

There was a reduction of the available data, such as overall and daily energy, current output, voltages and currents, and this data was assigned to the respective Modbus registers. This reduction and assignment between SMA device data and Modbus addresses is illustrated in an assignment table (see chapter 7).

It is not intended to provide every SMA device with a physical Modbus interface. In order to enable access to data of an SMA device that is not Modbus-capable, a special gateway is required that is provided by the data loggers (e.g. Sunny WebBox).

3.3 User-Defined Modbus Profile

The SMA Modbus Profile can be used as a basis for a user-defined Modbus Profile (see chapter 5.2). In it, the address assignments defined in the SMA Modbus Profile are redefined to other Modbus addresses.

The advantage of a reorganisation of Modbus addresses can be e.g. that measured values and parameters interesting for a special purpose can be placed on continuous Modbus addresses, one behind the other. These addresses with it can be read and set in one block.

3.4 Possible Network Topologies

The SMA Modbus Profile has been designed for a hierarchical plant structure. This structure contains a data logger (Sunny WebBox, SC-COM, etc.) as communication device that is equipped with a Modbus TCP/IP interface. All other SMA devices that are connected to the data logger via the SMA fieldbus are subordinate to the data logger.

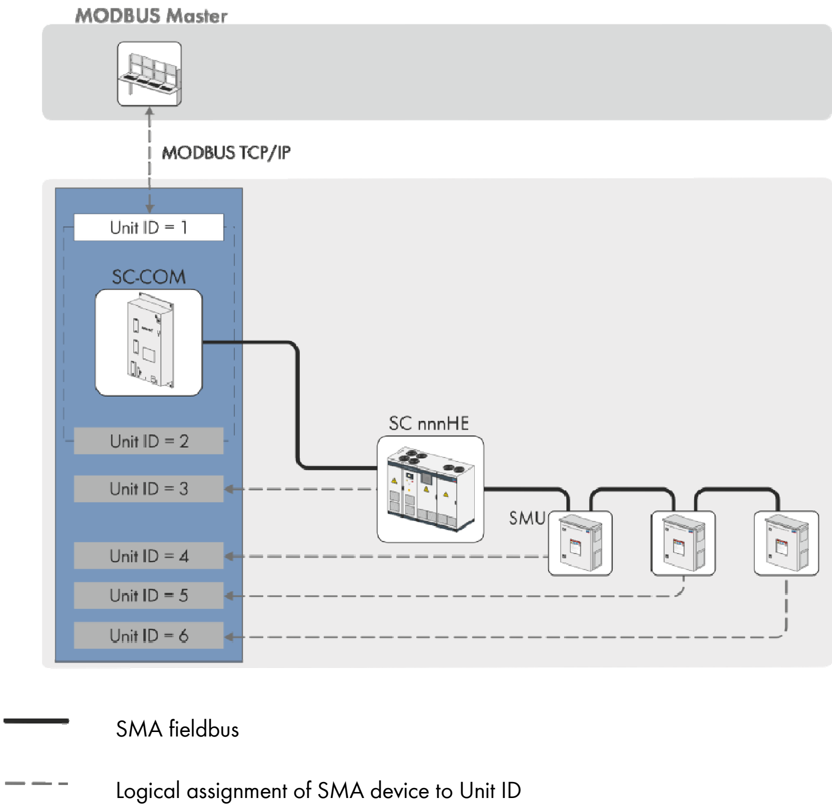
From the perspective of the Modbus protocol, the SC-COM is a Modbus slave that provides a gateway to subordinate SMA devices. The subordinate SMA devices can only be addressed using this gateway per Unit ID.

Unit ID

The Unit ID is a device identification in the Modbus protocol. The assignment of the SMA devices to a Unit ID is stored in an assignment table in the data logger under the Unit ID = 1 (gateway). The general plant parameters are stored there under the Unit ID = 2. Each subordinate SMA device (e.g. an inverter) is therefore assigned a Unit ID > 2 = (3 to 247).

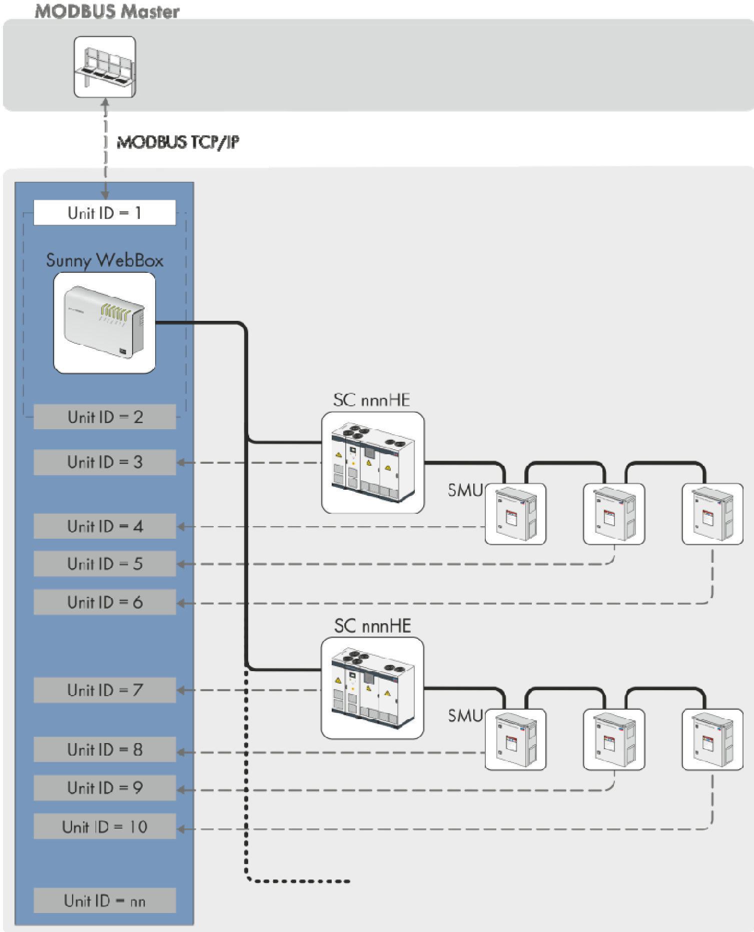
3.4.1 Sunny Central Communication Controller

Network topology for the Sunny Central Communication Controller (SC-COM) from the perspective of the SMA devices:



3.4.2 Sunny WebBox

Network topology for the Sunny WebBox from the perspective of the SMA devices:

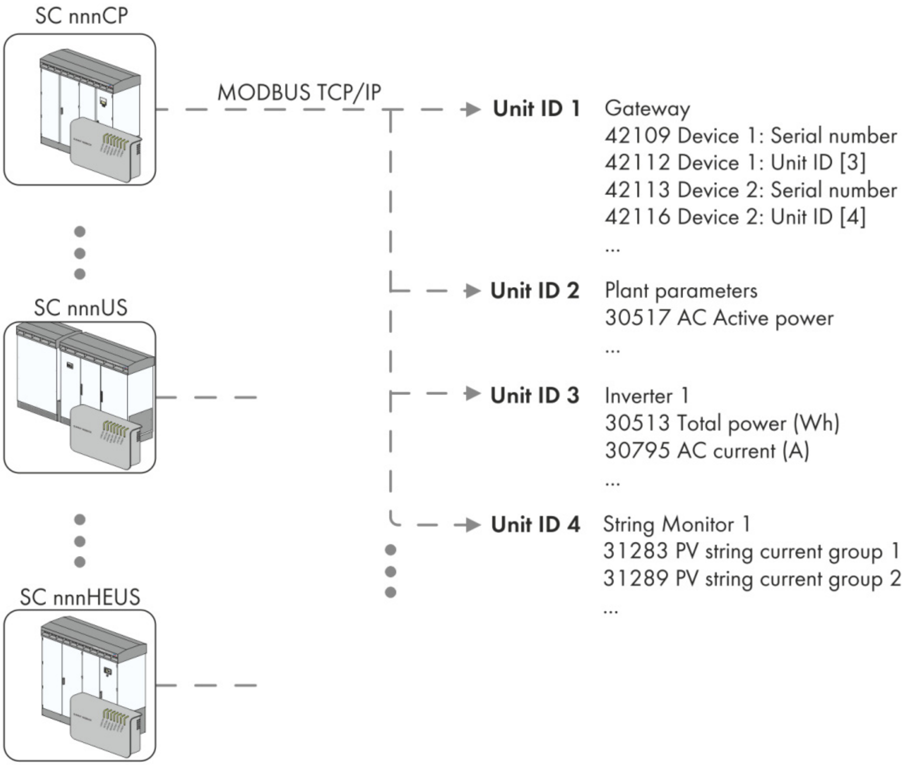


—— SMA fieldbus

– – – Logical assignment of SMA device to Unit ID

Network topology from the perspective of the Modbus:

In the graphic below, an inverter and its String Monitoring Unit are assigned a Unit ID. With it, their data become available on the Modbus protocol. Unit ID 1 and Unit ID 2 represent the gateway to the Modbus interface as well as the plant parameters.



4 Commissioning

Requirements:

☐ The devices in your plant have to be connected to the data logger and the plant has to be set into operation (see operating instructions or user guide of the respective data logger).

1. Check firmware version and if necessary carry out a firmware update, see sources [SC-COM] or [Sunny WebBox]. You can find the required firmware versions in chapter 9.1 “Supported SMA Devices”, page 87.

Background information to firmware update

When updating the firmware to a Modbus-capable version (see section “9.1 Supported SMA Devices", page 87), the SMA devices that are Modbus-capable and already detected in the data logger are automatically assigned Modbus Unit IDs. Once the firmware is updated, only Modbus must be activated.

2. Activate the Modbus server(s) and if necessary, configure the communication port(s) (see operating instructions or user guide of the respective data logger).
3. If necessary, detect new or replaced devices (detection, see operating instructions or user guide of the respective data logger). You can find further information on changed Unit IDs after detection in chapter 5.1.1 “Information on Unit IDs”, page 16.
4. If necessary, change the Unit IDs (see chapter 5.1)
5. If necessary, define and activate a user-defined Modbus profile (see chapter 5.2)

5 Configuration

5.1 Changing Unit IDs

5.1.1 Information on Unit IDs

Available and reserved Unit IDs

In the Modbus protocol 247 devices can be addressed via the Unit ID (see source [Modbus Serial]). The following table shows a summary of the reserved and free Unit IDs for both of the data loggers. In case of SC-COM additional Unit IDs and ranges of Unit IDs are intended to use for certain devices, whereby the reserved Unit IDs between cannot be used:

Unit ID	SC-COM	Sunny WebBox
1	Gateway	Gateway
2	Plant parameters	Plant parameters
3	SB n000US, SB nn000TL-US-12, SB SC nnnCP, SC nnnHE-20, SC nnnHE-US, SC nnnHE, SC nnnHE-11, SC nnnU, STP nn000TL-10	Disposable
4 to 99	Reserved	Disposable
100	User-defined Modbus-Profile	Disposable
101 to 109	Reserved	Disposable
110	Sunny Central String-Monitor Controller, Optiprotect	Disposable
111 to 119	Reserved	Disposable
120	SMA Meteo Station, Sunny Sensorbox	Disposable
121 to 139	Reserved	Disposable
140 to 189	Sunny String-Monitor, Sunny Central String-Monitor US	Disposable
190 to 247	Reserved	Disposable

Detecting Additional or Replaced SMA Devices

If other SMA devices are added or SMA devices are replaced, they must be detected in the data logger. When detecting, added or replaced SMA devices are designated with Unit IDs as follows:

Sunny WebBox:

- Unit ID = 255 (NaN), all of the added or replaced SMA devices. Please additionally consider the following note:

Addressing new or modified devices with Sunny WebBox

Detected additional or modified SMA devices are designated with the Modbus Unit ID = 255 (NaN). These devices can therefore not be addressed and their measured values and parameters cannot be accessed via the Modbus gateway. You have to manually change such assignments (see following chapter).

SC-COM:

- Possible Unit IDs, see table "Available and reserved Unit IDs", above. Please additionally consider the following note:

Addressing new or modified devices with SC-COM

When a detection leads to more devices than Unit IDs are intended to use, all SMA devices are designated with the Modbus Unit ID = 255 (NaN). These devices can therefore not be addressed and their measured values and parameters cannot be accessed via the Modbus gateway. You have to manually change such assignments (see following chapter).

5.1.2 Changing Unit IDs via the Gateway

Strategy:

- Read out the gateway assignment table
- Change the Unit ID in the gateway assignment table

Do not assign duplicate Unit IDs

You must not assign duplicate Unit IDs. If there is a duplicate assignment of a Unit ID, the device data that is entered in the assignment table of the gateway under the lowest Modbus address is always read out in the event of a Modbus request of this Unit ID.

Reading out the assignment table:

You can read out the individual Unit IDs of the SMA devices from the assignment table via the Modbus interface. You can access the assignment table using the gateway of the data logger under the Unit ID = 1.

Accessing the gateway

You access the gateway via the IP address of the data logger under the Unit ID = 1.

The assignment of the Unit IDs 3 to 247 is saved in the Modbus registers from address 42109. Each assignment has an address range of 4 Modbus registers (see the following example), whereby in each case only the register with the Unit ID can be written. You can find the assignment table of the gateway in chapter 7.2.1 "Gateway", page 30.

Exemplary assignment table for Sunny WebBox:

After a device is detected, the assignment table in your Modbus master system looks as follows (example):

Modbus address	Content	Description	Device #
...	...	...	
42109	*158*	*Device-ID*	A
42110	*2145600972*	*Serial number*	A
42112	*3*	*Unit ID*	A
42113	*160*	*Device-ID*	B
42114	*2145600320*	*Serial number*	B
42116	*4*	*Unit ID*	B
42117	*215*	*Device-ID*	C
42118	*2145600934*	*Serial number*	C

42120	*255*	*Unit ID*	C
…	…	…	…
43085	*189*	*Device-ID*	X
43086	*4294967294*	*Serial number*	X
43088	*255*	*Unit ID*	X

Changing the Unit ID in the gateway assignment table:

You change a Unit ID by writing it to the corresponding Modbus address. For the following example, this means that the new Unit ID has to be written to Modbus address 42116. You can do this using your Modbus master system, e.g. a SCADA system.

Example for changing the Unit ID in the assignment table of the Sunny WebBox:

The following table shows an example assignment. An inverter "Sunny Central 500CP" (device-ID = 160, serial number 1134365300) has been detected subsequently as the second device in the plant. The Unit ID of this device was manually set to 4:

Modbus address		After detection	Modified
42113	Device-ID	160	160
42114	Serial number	2145600320	2145600320
42116	Unit ID	255 (NaN)	4

5.2 Creating a User-Defined Modbus Profile

User-defined Modbus profile only available on SC-COM

The user-defined Modbus profile is only available on SC-COM, not on the Sunny WebBox.

You can change the assignment of Modbus addresses by creating a user-defined Modbus profile. In the user-defined Modbus profile you can reassign the addresses that were predefined in the SMA Modbus profile to other Modbus addresses. You can use the whole Modbus address range between 0 and 65535. The user-defined Modbus profile can be accessed like other devices via the gateway and the profile has a Unit ID set to 100 by default. You can later change the Unit ID and set it between 3 and 247 (Unit ID rules in Section 5.1).

Changing the Unit ID of the user-defined Modbus profile

You can find information on changing the Unit ID of the user-defined Modbus profile in the operating manual of SC-COM.

The user-defined Modbus profile is defined in the file "virtualmodbus.xml" additionally to the SMA Modbus profile.

One advantage of the user-defined Modbus profile is that all measured values and parameters, which are relevant for controlling your plant, can be put on consecutively running Modbus addresses and hence, can be read or set in one block.

The XML file's basic structure looks like this:

```
<?xml version="1.0" encoding="UTF-8"?>
<virtual_modbusprofile>
        <channel unitid="aaa" source="bbbbb" destination="ccccc" />
        ...
</virtual_modbusprofile>
```

Legend for XML tags and attributes:

XML tag or attribute	Explanation
<virtual_modbusprofile> </virtual_modbusprofile>	The user-defined Modbus profile is defined within this XML structure.
<channel />	Within a channel tag, a new Modbus address can be defined in a Unit ID:
unitid="aaa"	Specifies the Unit ID of a device which Modbus addresses have to be redefined. Available Unit IDs for individual devices are 1 to 247.

source=”bbbbb”	Specifies a Modbus address of a device selected under "unitid" whose value is to be used as source. Information on the assignment tables, see Chapter 7).
destination=”ccccc”	Specifies the new Modbus address from which the value is to be retrieved (0 to 65535). Please consider the number of Modbus registers that are stored at the initial address. The destination registers must not overlap. If definitions are set to invalid addresses, a Modbus exception is generated. If definitions are set to addresses which don't have values inquiries are answered with NaN.

Modbus exceptions

You will find information on Modbus exceptions in section “Other documents” in source [MBAP].

Uploading and downloading XML files

For further information on uploading and downloading files via the web interface, refer to the data logger user manual.

Activating a user-defined Modbus profile

To activate your user-defined Modbus profile, load the file "virtualmodbus.xml" on the data logger.

Deactivating the user-defined Modbus profile

To deactivate your user-defined Modbus profile, load an empty file "virtualmodbus.xml" on the data logger. The following two lines show an empty file "virtualmodbus.xml":

```
<?xml version=“1.0“ encoding=“UTF-8“?>
<virtual_modbusprofile></virtual_modbusprofile>
```

If the use of the user-defined Modbus profile on the data logger is deactivated, the user-defined assignments are lost and only the SMA Modbus profile stays active.

Example of a user-defined Modbus profile "virtualmodbus.xml"**:**

Various registers of the devices stored under the Unit IDs 3 and 140 (see both of the following tables) are to be written as consecutively running Modbus addresses from address 00000 on. The number of Modbus registers per value (CNT) must be considered. The number is 2 for each of the tree values.

(The following tables are excerpts from the SMA Modbus profile):

ADR (DEC)	Description / Return code	CNT (2 bytes)	Format	Display	Type	Access
30531	Total yield (kWh) [E-Total]	2	U32	Scalar	FIX0	RO
30775	AC active power on all line conductors (W) [Pac]	2	S32	Scalar	FIX0	RO

ADR (DEC)	Description / Return code	CNT (2 bytes)	Format	Display	Type	Access
31793	String current of the string 1 of an SMU/SMID (A) [IString 1]	2	S32	Scalar	FIX3	RO
31795	String current of the string 2 of an SMU/SMID (A) [IString 2]	2	S32	Scalar	FIX3	RO
31797	String current of the string 3 of an SMU/SMID (A) [IString 3]	2	S32	Scalar	FIX3	RO

The exact structure of the XML file looks like this:

```
<?xml version="1.0" encoding="utf-8"?>
<virtual_modbusprofile>
    <channel unitid="3" source="30531" destination="0" />
    <channel unitid="3" source="30775" destination="2" />
    <channel unitid="140" source="31793" destination="4" />
    <channel unitid="140" source="31795" destination="6" />
    <channel unitid="140" source="31797" destination="8" />
</virtual_modbusprofile>
```

6 Interface Definition

6.1 SMA Data Formats

Data formats used by SMA are 16, 32, and 64 bits wide. The width of a Modbus register is 16 bits. The registers are transmitted in Motorola format (big-endian), meaning that the high byte is transmitted first and then the low byte.

Reading and writing Modbus registers

Background to the Modbus interface described in this document is that n Modbus registers must each be read and written in one step. If for example two 16 bit Modbus registers are read into a 32 bit SMA data format, the 4 bytes of both registers must be read with one read operation.

The SMA data formats are used in the assignment table, in the "Format" column. They describe the data widths and properties of the assigned values. If an assignment is not implemented, a Modbus exception is returned as an error.

6.1.1 Data Formats and NaN Values

The following data formats are supported by the SMA Modbus Profile:

Format	Description	NaN value
U16	A word (16 bit/WORD) in the local processor format	0xFFFF
S16	Signed word (16 bit/WORD) in the local processor format	0x8000
U32	A double word (32 bit/DWORD) in the local processor format	0xFFFFFFFF
S32	A signed double word (32 bit/DWORD) in the local processor format	0x80000000
U64	A quad word (64 bit/2 x DWORD) in the local processor format	0xFFFFFFFFFFFFFFFF

6.1.2 16 Bit Integer Values

16 bit integers are stored in a register in big-endian sorting.

Modbus register	1	
Byte	0	1
Bits	8 ... 15	0 ... 7

U16: 0 ... 65535 Not implemented: 0xFFFF

S16: -32767 ... 32767 Not implemented: 0x8000

Example: 32.000 (U16) = 7D 00

6.1.3 32 Bit Integer Values

32 bit integers are stored in two registers in big-endian sorting.

Modbus register	1		2	
Byte	0	1	2	3
Bits	24 ... 31	16 ... 23	8 ... 15	0 ... 7

U32: 0 ... 4294967294 Not implemented: 0xFFFFFFFF

S32: -2147483647 ... 2147483647 Not implemented: 0x80000000

Example: 136.534.944 (U32) = 08 23 5B A0

6.1.4 64 Bit Integer Values

64 bit integers are stored in four registers in big-endian sorting.

Modbus register	1		2	
Byte	0	1	2	3
Bits	56 ... 63	48 ... 55	40 ... 47	32 ... 39
Modbus register	**3**		**4**	
Byte	4	5	6	7
Bits	24 ... 31	16 ... 23	8 ... 15	0 ... 7

U64: 0 ... 18446744073709551614 Not implemented: 0xFFFFFFFFFFFFFFFF

6.2 SMA Data Types

The following SMA data types describe which types of data are transmitted. The SMA data types are used in the assignment table, in the "Type" column.

Type	Explanation
Duration	**Time period** Output in seconds
DT	**Date/Time** Output of date/time, in accordance with country setting. Transmission as UTC (without Summertime) in seconds since 01/01/1970.
FIX0	**Factor 1** Output as decimal number, commercially rounded, no decimal places.
FIX1	**Factor 0.1** Output as decimal number, commercially rounded, one decimal place.
FIX2	**Factor 0.01** Output as decimal number, commercially rounded, two decimal places.
FIX3	**Factor 0.001** Output as decimal number, commercially rounded, three decimal places.
FW	Firmware version (e.g. 1.12.0.R), see excursus below.
RAW	Output as text or number, depending on data format of the value. Numbers without decimal places and without thousand or other separation indicators.
ENUM	This type of parameter can provide various status values. The parameters are returned as code. You will find the breakdown of the code in the appropriate section of the SMA Modbus Profile assignment table.
TEMP	**Temperature** The values are given in degrees Celsius. The output is given commercially rounded with one decimal place.

Firmware version excursus (FW): Four values are extracted from the delivered DWORD. The values "Major" and "Minor" are contained BCD coded in bytes 1 and 2. Byte 3 contains the "Build" value (not BCD coded). The "Release type" in accordance with the following table is contained in the 4th byte:

Value	Version	Explanation
0	N	NOREV
1	E	EXPERIMENTAL
2	A	ALPHA
3	B	BETA
4	R	RELEASE
5	S	SPECIAL
> 5	As number	No special interpretation

Example:

Values from DWORD: Major: 1, Minor: 5, Build: 10, Release type: 3
(Hex: 0x1 0x5 0xA 0x4)

6.3 Addressing and Data Transfer in Modbus Protocol

The Modbus register address forms the start address of a data block. A data block equates to a single data set and can be made up of a single or several Modbus registers. The number of required Modbus registers is given in the assignment table.

Addressing Modbus registers

The address range 0-0xFFFF with 65536 addresses is available for addressing Modbus registers. One register is 16 bits wide. For broader data formats, connected registers are used.

In order to avoid inconsistencies, data blocks must always be read or written completely.

According to the Modbus specification, only a certain amount of user data can be transmitted during a data transmission (message). The amount of user data is dependent on the used Modbus command (You can find the possible number of user data registers by command in the following chapter). Function-dependent parameters (e.g. function code, start address, number of registers) are also considered user data. This must be taken into consideration during the request.

6.4 Reading and Writing Data in Modbus Protocol

The following Modbus commands are supported by the implemented Modbus interface:

Modbus Command	Hexadecimal Value	User Data (Number of Registers)
Read Holding Registers	0x03	1 to 125
Read Input Registers	0x04	1 to 125
Write Single Register	0x06	1
Write Multiple Registers	0x10	1 to 123
Read Write Multiple Registers	0x17	Read: 1 to 125 Write: 1 to 121

NaN as answer

If an undefined value is called up from a Modbus register, "NaN" is returned as the answer. You will find possible NaN values in section 6.1.1.

Modbus exception if access to a register fails

For each inverter type, only certain Modbus registers are available. If a Modbus register is not available for an inverter type, a Modbus exception will be generated upon accessing this register.

Modbus exception if the setting of several registers fails

If several registers are set one after another in a packet (Modbus commands 0x10 and 0x17) and an error occurs during setting, the next register in the packet will be processed! If data is mutually dependent or excludes each other a block will only be processed if it is valid completely. Otherwise, the complete block will be rejected. In the event of an error a Modbus exception will be generated.

Modbus exceptions

You will find information on Modbus exceptions in section “Other documents” in source [MBAP].

7 SMA Modbus Profile – Assignment Tables

7.1 Information on the Assignment Tables

The following sections are sorted by Unit ID. Each section contains a table of the Modbus addresses which can be accessed under the corresponding Unit ID. This means that SMA device registers are assigned Modbus addresses under a Unit ID. The tables present the following information:

Information	Explanation
ADR	Decimal Modbus address (see also chapter 6.3 and following)
Description/Return code	Brief description of the stored numerical value and the possible return codes. The name of the SMA data channel is additionally specified in square brackets if available.
CNT	Number of utilized Modbus registers (see also chapter 6.1 and following)
Format	Format and width of the stored values, e.g. U32 = 32 bit without algebraic sign (see also chapter 6.1)
Display	Scalar or status. Scalar delivers a direct interpretable numerical value whose type is specified in the "Type" column. Status delivers one or more code(s), as specified in the corresponding "Description/Return code".
Type	The value type of the stored value, e.g. DT = date, FIX n = with n decimal places, TEMP = temperature (see also chapter 6.2)
Access	Access type for Modbus TCP (see chapter 6.4 “Reading and Writing Data in Modbus Protocol”, page 28): RO: read-only access RW: read-write access In case an access type is not supported, a Modbus exception will be returned.

Modbus exceptions

You will find information on Modbus exceptions in section “Other documents” in source [MBAP].

7.2 Data Logger

7.2.1 Gateway

You can access the gateway of the data logger under the Unit ID = 1. The following table contains the values provided by the gateway as well as the assignment of the subordinate SMA devices to the Unit IDs:

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30001	Version number of the SMA Modbus profile	2	U32	Scalar	RAW	RO
30007	Modbus data change: Counter value will increase if data in the Profile has changed.	2	U32	Scalar	RAW	RO
30057	Serial number [Serial Number] of the data logger	2	U32	Scalar	RAW	RO
	Assignment Unit ID – SMA devices: See also section "Changing Unit IDs", page 16.					
42109	Device 1: Device-ID	1	U16	Scalar	RAW	RO
42110	Device 1: Serial number	2	U32	Scalar	RAW	RO
42112	Device 1: Unit ID, e.g. 3	1	U16	Scalar	RAW	RW
42113	Device 2: Device-ID	1	U16	Scalar	RAW	RO
42114	Device 2: Serial number	2	U32	Scalar	RAW	RO
42116	Device 2: Unit ID, e.g. 4	1	U16	Scalar	RAW	RW
...	...	...	...	...	...	...
43085	Device 245: Device-ID	1	U16	Scalar	RAW	RO
43086	Device 245: Serial number	2	U32	Scalar	RAW	RO
43088	Device 245: Unit ID, e.g. 247	1	U16	Scalar	RAW	RW

For Unit ID = 255, please observe chapter 5.1 “Changing Unit IDs", page 16.

7.2.2 Plant Parameters

You can access the plant parameters under the Unit ID = 2. The following table contains the plant parameter provided by the data logger:

ADR (DEC)	Description / Return code	CNT (2 bytes)	Format	Display	Type	Access
30001	Version number of the SMA Modbus profile	2	U32	Scalar	RAW	RO
30007	Modbus data change: Counter value will increase if data in the Profile has changed.	2	U32	Scalar	RAW	RO
30057	Serial number of the data logger [Serial Number]	2	U32	Scalar	RAW	RO
30193	Reading of the plant time (UTC) [SerTm]	2	U32	Scalar	DT	RO
30195	Reading of the time zone (UTC). For possible values, see section "Return Codes for Time Zones", page 92.	2	U32	Scalar	ENUM	RO
30513	Total yield (Wh) [E-Total]	4	U64	Scalar	FIX0	RO
30517	Day yield (Wh) [E-heute]	4	U64	Scalar	FIX0	RO
30529	Total yield (Wh) [E-Total]	2	U32	Scalar	FIX0	RO
30531	Total yield (kWh) [E-Total]	2	U32	Scalar	FIX0	RO
30533	Total yield (MWh) [E-Total]	2	U32	Scalar	FIX0	RO
30535	Day yield (Wh) [E-heute]	2	U32	Scalar	FIX0	RO
30537	Day yield (kWh) [E-heute]	2	U32	Scalar	FIX0	RO
30539	Day yield (MWh) [E-heute]	2	U32	Scalar	FIX0	RO
30775	AC active power across all phases (W) [Pac]	2	S32	Scalar	FIX0	RO

40001	Setting of the plant time (UTC) [SerTm]	2	U32	Scalar	DT	RW
40003	Selected time zone for the display [TmZn]. For possible values, see section "Return Codes for Time Zones", page 92.	2	U32	Status	ENUM	RW

7.3 SMA Devices

Availability of the Modbus registers

For each inverter type, only certain Modbus registers are available. If a Modbus register is not available for an inverter type, a Modbus exception will be generated upon accessing this register.

You will find information on Modbus exceptions in section “Other documents” in source [MBAP].

7.3.1 Common Addresses of all SMA Devices

In the following table, you will find the measured values and parameters, which you can access under the Unit IDs = 3-247. The table does not apply to the Unit IDs 1 and 2:

ADR (DEC)	Description / Return code	CNT (2 bytes)	Format	Display	Type	Access
30057	Serial number [Serial Number]	2	U32	Scalar	RAW	RO
30193	Reading of the plant time (UTC) [SerTm]	2	U32	Scalar	DT	RO
30197	Event ID of the current event (number of digits is limited by the device) [ErrNo]; see also chapter “Troubleshooting”.	2	U32	Scalar	FIX0	RO
30231	Maximum possible continuous active power, fixed configuration. Can be greater than the nominal power (W) [Plimit]	2	U32	Scalar	FIX0	RO
30233	Permanent active power limitation (W) [Pmax]	2	U32	Scalar	FIX0	RO
30513	Total yield (Wh) [E-total]	4	U64	Scalar	FIX0	RO
30517	Day yield (Wh) [E-heute]	4	U64	Scalar	FIX0	RO
30521	Operating hours (s) [h-On]	4	U64	Scalar	Duration	RO
30525	Feed-in hours (s) [h-total]	4	U64	Scalar	Duration	RO
30529	Total yield (Wh) [E-Total]	2	U32	Scalar	FIX0	RO
30531	Total yield (kWh) [E-Total]	2	U32	Scalar	FIX0	RO

30533	Total yield (MWh) [E-Total]	2	U32	Scalar	FIX0	RO
30541	Operating hours (s) [h-on]	2	U32	Scalar	Duration	RO
30543	Einspeisestunden (s) [h-Total]	2	U32	Scalar	Duration	RO
30769	DC current input (A) [Ipv]	2	S32	Scalar	FIX3	RO
30771	DC voltage input (V) [Vpv]	2	S32	Scalar	FIX2	RO
30773	DC power input (W) [Ppv]	2	S32	Scalar	FIX0	RO
30775	AC active power across all phases (W) [Pac]	2	S32	Scalar	FIX0	RO
30789	Grid voltage phase AB (V) [VacL12]	2	U32	Scalar	FIX2	RO
30791	Grid voltage phase BC (V) [VacL23]	2	U32	Scalar	FIX2	RO
30793	Grid voltage phase CA (V) [VacL31]	2	U32	Scalar	FIX2	RO
30795	Grid current (A) [Iac]	2	U32	Scalar	FIX3	RO
30803	Power frequency (Hz) [Fac]	2	U32	Scalar	FIX2	RO
30805	Reactive power (var) [Qac]	2	S32	Scalar	FIX2	RO
30813	Apparent power[1] (VA) [Sac]	2	S32	Scalar	FIX0	RO
30837	Active power target value (W) [P-W]	2	U32	Scalar	FIX0	RO
34109	Heat sink temperature 1 (°F) [TmpHs]	2	S32	Scalar	TEMP	RO
34113	Interior temperature 1 (°F) [TmpCab1]	2	S32	Scalar	TEMP	RO
34125	External temperature 1 (air supply) (°F) [TmpExl1]	2	S32	Scalar	TEMP	RO
40001	Setting of the plant time (UTC) [SerTm]	2	U32	Scalar	DT	RW

[1] Due to internal calculation of the apparent power [Sac] for SC nnnCP it cannot be guaranteed that this value is available synchronous to the measured values reactive power [Qac] and active power [Pac].

7.3.2 Device Family SB n000US

In the following table, you will find the measured values and parameters supported by the SB n000US device family, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16):

Address compatibility

The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33, do **not** apply to this device type!

ADR (DEC)	Description / Return code	CNT (2 Bytes)	Format	Display	Type	Access
30051	Device class [MainModel]: 260 = Solar inverter	2	U32	Status	ENUM	RO
30057	Serial number [SMA SN]	2	U32	Scalar	RAW	RO
30213	Message [Error]: 71 = Interference of device 84 = Over current grid (HW) 87 = Grid frequency disturbance 89 = Grid disconnection point 90 = Deviation grid voltage measurement 125 = Overvoltage input A (SW) 132 = System data defective 133 = System data access not possible 134 = System data restored 141 = Derating occurred 145 = Relay defect 148 = Internal communication 156 = Execution (Operation) 168 = Code memory defective 189 = Execution (State machine) 208 = Execution (Watchdog) 520 = Over temperature	2	U32	Status	ENUM	RO

	transformer area 540 = Ground fuse missing 542 = Internal measurement comparison fault 543 = Internal measurement comparison fault 546 = Measurement recording fault 547 = Grid fault reported 973 = – 1004 = Grid type detection failed 1007 = Over current Ground fuse 1255 = Grid voltage fault 1598 = Transformer incorrectly connected					
30231	Maximum permanent active power, set unchangeable. Can be higher than the rated power (W) [Plimit]	2	U32	Scalar	FIX0	RO
30233	Permanent active power limitation (W) [Pmax]	2	U32	Scalar	FIX0	RO
30235	Status of the backup mode [Backup State]: 937 = – 1440 = Grid mode 1441 = Separate grid mode	2	U32	Status	ENUM	RO
30237	Grid type [Grid Type]: 973 = – 1433 = 277 Volt 1434 = 208 Volt 1435 = 240 Volt 1436 = 208 Volt without neutral conductor 1437 = 240 Volt without neutral conductor	2	U32	Status	ENUM	RO
30239	Operating mode of the PowerBalancer [Balancer]: 303 = Off 1442 = PhaseGuard 1443 = PowerGuard 1444 = FaultGuard	2	U32	Status	ENUM	RO

30241	Operation mode [Mode]: 295 = MPP 381 = Stop 443 = Constant voltage 557 = Temperature derating is active 565 = Power specification via characteristic curve 1392 = Fault 1466 = Waiting 1467 = Starting 1468 = Searching for MPP 1470 = Disturbance 2100 = Power limitation to avoid unbalanced load (Power Balancing)	2	U32	Status	ENUM	RO
30513	Total yield (Wh) [E-Total]	4	U64	Scalar	FIX0	RO
30521	Operating hours (s) [h-On]	4	U64	Scalar	Duration	RO
30525	Feed-in hours (s) [h-Total]	4	U64	Scalar	Duration	RO
30529	Total yield (Wh) [E-Total]	2	U32	Scalar	FIX0	RO
30561	Number of events for installer [Event-Cnt]	2	U32	Scalar	FIX0	RO
30769	DC current input (A) [Ipv]	2	S32	Scalar	FIX3	RO
30771	DC voltage input (V) [Vpv]	2	S32	Scalar	FIX2	RO
30775	AC active power across all phases (W) [Pac]	2	S32	Scalar	FIX0	RO
30783	Grid voltage L1 against N (V) [VacL1]	2	U32	Scalar	FIX2	RO
30785	Grid voltage L2 against N (V) [VacL2]	2	U32	Scalar	FIX2	RO
30797	Grid current L1 (A) [Iac]	2	U32	Scalar	FIX3	RO
30803	Power frequency (Hz) [Fac]	2	U32	Scalar	FIX2	RO

40007	Type of inverter control [Operating mode]: 295 = MPP 381 = Stop 443 = Constant voltage 565 = Power specification via characteristic curve	2	U32	Status	ENUM	RW

7.3.3 Device Family SB nn000TL-US-12

In the following table, you will find the measured values and parameters supported by the SB nn000TL-US-12 device family, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16):

Address compatibility

The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33, do **not** apply to this device type!

ADR (DEZ)	Description / Return code	CNT (2 Bytes)	Format	Display	Type	Access
30051	Device class [MainModel]: 260 = Solar inverter	2	U32	Status	ENUM	RO
30057	Serial number [SMA SN]	2	U32	Scalar	RAW	RO
30213	Message [Error]: 71 = Interference of device 84 = Over current grid (HW) 85 = Over current grid (HW) (SW) 87 = Grid frequency disturbance 90 = Deviation grid voltage measurement 99 = High discharge current 110 = DI converter fault 112 = Residual current 119 = DC grid feed-in 123 = Overvoltage intermediate circuit (SW) 125 = Overvoltage input A (SW) 132 = System data defective 133 = System data access not possible 134 = System data restored 139 = Execution (Test HW) 141 = Derating occurred 145 = Relay defect 148 = Internal communication	2	U32	Status	ENUM	RO

	149 = Insulation failure 150 = Sensor system insulation resistance 156 = Execution (Operation) 163 = L / N swapped 166 = Memory defective 168 = Code memory defective 189 = Execution (State machine) 207 = Bridge short-circuit 208 = Execution (Watchdog) 542 = Internal measurement comparison fault 543 = Internal measurement comparison fault 546 = Measurement recording fault 547 = Grid fault reported 973 = – 1003 = Intermediate circuit voltages not permitted 1004 = Grid type detection failed 1255 = Grid voltage fault. 1655 = Electric arc detected 1657 = AFCI self-test failed					
30231	Maximum permanent active power, set unchangeable. Can be higher than the rated power (W) [Plimit]	2	U32	Scalar	FIX0	RO
30233	Permanent active power limitation (W) [Pmax]	2	U32	Scalar	FIX0	RO
30235	Status of the backup mode [Backup State]: 937 = – 1440 = Grid mode 1441 = Separate grid mode	2	U32	Status	ENUM	RO

30237	Grid type [Grid Type]: 973 = – 1435 = 240 Volt 1436 = 208 Volt without neutral conductor 1437 = 240 Volt without neutral conductor 1530 = 208V WYE	2	U32	Status	ENUM	RO
30239	Operating mode of the PowerBalancer [Balancer]: 303 = Off 1442 = PhaseGuard 1443 = PowerGuard 1444 = FaultGuard	2	U32	Status	ENUM	RO
30241	Operation mode [Mode]: 295 = MPP 381 = Stop 443 = Constant voltage 557 = Temperature derating is active 1392 = Fault 1466 = Waiting 1467 = Starting 1468 = Searching for MPP 1470 = Disturbance 2100 = Power limitation to avoid unbalanced load (Power Balancing) 2101 = Insulation measurement	2	U32	Status	ENUM	RO
30513	Total yield (Wh) [E-Total]	4	U64	Scalar	FIX0	RO
30521	Operating hours (s) [h-On]	4	U64	Scalar	Duration	RO
30525	Feed-in hours (s) [h-Total]	4	U64	Scalar	Duration	RO
30529	Total yield (Wh) [E-Total]	2	U32	Scalar	FIX0	RO
30561	Number of events for installer [Event-Cnt]	2	U32	Scalar	FIX0	RO
30769	DC current input (A) [Ipv]	2	S32	Scalar	FIX3	RO

30771	DC voltage input (V) [Vpv]	2	S32	Scalar	FIX2	RO
30775	AC active power across all phases (W) [Pac]	2	S32	Scalar	FIX0	RO
30783	Grid voltage L1 against N (V) [VacL1]	2	U32	Scalar	FIX2	RO
30785	Grid voltage L2 against N (V) [VacL2]	2	U32	Scalar	FIX2	RO
30797	Grid current L1 (A) [Iac]	2	U32	Scalar	FIX3	RO
30803	Power frequency (Hz) [Fac]	2	U32	Scalar	FIX2	RO
40007	Type of inverter control [Operating mode]: 295 = MPP 381 = Stop 443 = Constant voltage	2	U32	Status	ENUM	RW

7.3.4 Device Family SC nnnCP and SC nnnHE-20

In the following table, you will find the measured values and parameters supported by the SC nnnCP and SC nnnHE-20 device family, which you can access under the Unit IDs = 3-247 (see section 5.1.1 “Information on Unit IDs”, page 16). The assignments in section 7.3.1 “Common Addresses of all SMA Devices”, page 33 also apply to this table:

ADR (DEC)	Description / Return code	CNT (2 bytes)	Format	Display	Type	Access
30195	Reading of the time zone (UTC) [TmZn]: For possible values, see section "Return Codes for Time Zones", page 92.	2	U32	Scalar	ENUM	RO
30199	Time until grid connection attempt (s) [TmsRmg]	2	U32	Scalar	Duration	RO
30211	Recommended action [Prio]: 336 = Contact manufacturer service 337 = Contact installer 338 = Invalid	2	U32	Status	ENUM	RO
30217	Grid contactor [GriSwStt]: 51 = Contactor closed 311 = Contactor open	2	U32	Status	ENUM	RO
30225	Insulation resistance (ohms) [Riso]	2	U32	Scalar	FIX0	RO
30227	Status of the key switch [DInKeySwStrStp]: 381 = Stop 569 = Activated	2	U32	Status	ENUM	RO
30241	Operating state [Mode]: 309 = Operation 381 = Stop 455 = Warning 1392 = Error 1393 = Wait for PV voltage 1394 = Wait for AC grid 1480 = "Wait for electricity supplier" operating state (for regulation 0 %)	2	U32	Status	ENUM	RO

30243	Error [Error]: 267 = Inverter 1395 = DC section 1396 = AC grid	2	U32	Status	ENUM	RO
30257	DC switch in cabinet [DcSwStt]: 51 = Closed 311 = Open	2	U32	Status	ENUM	RO
30261	AC switch 1 in cabinet [AcSwStt]: 51 = Closed 311 = Open	2	U32	Status	ENUM	RO
30265	AC switch-disconnector in cabinet [AcDiscon]: 51 = Closed 311 = Open	2	U32	Status	ENUM	RO
30535	Day yield (Wh) [E-heute]	2	U32	Scalar	FIX0	RO
30537	Day yield (kWh) [E-heute]	2	U32	Scalar	FIX0	RO
30539	Day yield (MWh) [E-heute]	2	U32	Scalar	FIX0	RO
30545	Operating hours interior fan 1 (s) [CntFanCab1]	2	U32	Scalar	Duration	RO
30547	Operating hours interior fan 2 (s) [CntFanCab2]	2	U32	Scalar	Duration	RO
30549	Operating hours heat sink fan (s) [CntFanHs]	2	U32	Scalar	Duration	RO
30557	Operating hours cabinet heating 2 (s) [CntHtCab2]	2	U32	Scalar	Duration	RO
30797	Grid current L1 (A) [IacL1]	2	U32	Scalar	FIX3	RO
30799	Grid current L2 (A) [IacL2]	2	U32	Scalar	FIX3	RO
30801	Grid current L3 (A) [IacL3]	2	U32	Scalar	FIX3	RO
30821	Current, average displacement power factor from active power and reactive power, across all phases [PF]	2	U32	Scalar	FIX2	RO

30823	Excitation type of cos(Phi) [PFExt]: 973 = – 1041 = Overexcited 1042 = Underexcited	2	U32	Status	ENUM	RO
30825	Operating mode of reactive power regulation [Q-VArMod]: 303 = Off 1069 = Reactive power/Voltage characteristic curve Q(U) 1070 = Reactive power Q, direct default setting 1071 = Reactive power const. Q (kvar) 1072 = Reactive power Q, default setting via plant control 1074 = cos(Phi), direct default setting 1075 = cos(Phi), default setting via plant control 1076 = cos(Phi)(P) – characteristic curve 1387 = Reactive power Q, default setting via analog input 1388 = cos(Phi), default setting via analog input 1389 = Reactive power/Voltage characteristic curve Q(U) with hysteresis and deadband	2	U32	Status	ENUM	RO
30827	Reactive power target value (var) [Q-VAr]	2	S32	Scalar	FIX0	RO
30829	Reactive power target value (%) [Q-VArNom]	2	S32	Scalar	FIX1	RO
30831	Target value cos(Phi) [PF-PF]	2	S32	Scalar	FIX2	RO
30833	Target value excitation type of cos(Phi) [PF-PFExt]: 973 = – 1041 = Overexcited 1042 = Underexcited	2	U32	Status	ENUM	RO

30835	Operating mode of active power limitation [P-WMod]: 303 = Off 1077 = Active power limitation P (W) 1078 = Active power limitation P (% Pmax) 1079 = Active power limitation P through plant control 1390 = Active power limitation P via analog inputs 1391 = Active power limitation P via digital inputs	2	U32	Status	ENUM	RO
30839	Active power target value (%) [P-WNom]	2	U32	Scalar	FIX0	RO
30841	AC voltages (average of all string voltages) (V) [Vac]	2	U32	Scalar	FIX2	RO
30919	Operating mode / configuration of static voltage-stability for “Q on Demand” [QoDQ-VArMod]: 303 = Off 973 = – 1069 = Reactive power/voltage characteristic curve Q(U) 1070 = Reactive power Q, direct specification 1071 = React. power const. Q in kvar 1072 = Q specified by plant control 1387 = Reactive power Q, specified via analogue input 1389 = Reactive power/volt. char. Q(U) parameterised	2	U32	Status	ENUM	RO
30921	Reactive power setpoint for “Q on Demand” (var) [QoDQ-VAr]	2	S32	Scalar	FIX0	RO
30923	Reactive power setpoint for “Q on Demand” (%) [QoDQ-VArNom]	2	S32	Scalar	FIX1	RO

34097	Operating hours interior fan 1 (s) [CntFanCab1]	4	U64	Scalar	Duration	RO
34101	Operating hours interior fan 2 (s) [CntFanCab2]	4	U64	Scalar	Duration	RO
34105	Operating hours heat sink fan (s) [CntFanHs]	4	U64	Scalar	Duration	RO
34117	Interior temperature 3 (°F) [TmpCab3]	2	S32	Scalar	TEMP	RO
34141	Operating hours interior heater 2 (s) [CntHtCab2]	4	U64	Scalar	Duration	RO
34145	Temperature of the sine-wave filter chokes (°F) [TmpCol]	2	S32	Scalar	TEMP	RO
34613	Total irradiation on sensor surface (W/m²) [ExtSolIrr]	2	U32	Scalar	FIX0	RO
34637	Total irradiation on sensor surface (Analogue current input AI1) (mA) [ExtSolIrr]	2	U32	Scalar	FIX0	RO
40003	Selected time zone for the display [TmZn]. For possible values, see section "Return Codes for Time Zones", page 92.	2	U32	Status	ENUM	RW
40009	Operating state [SpntRemEna]: 381 = Stop 569 = Switched on	2	U32	Status	ENUM	RW
40020	External measurement of the insulation resistance: 303 = Off 308 = On	2	U32	Status	ENUM	RW

7.3.5 Device Family SC nnnHE-US

In the following table, you will find the measured values and parameters supported by the SC nnnHE-US device family, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16). The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33 also apply to this table:

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30199	Time until grid connection attempt (s) [TmsRmg]	2	U32	Scalar	Duration	RO
30211	Recommended action [Prio]: 336 = Contact manufacturer service 337 = Contact installer 338 = Invalid	2	U32	Status	ENUM	RO
30217	Grid contactor [GdCtcStt]: 51 = Contactor closed 311 = Contactor open	2	U32	Status	ENUM	RO
30241	Operating state [Mode]: 309 = Operation 455 = Warning 1392 = Error 1470 = Fault	2	U32	Status	ENUM	RO
30243	Error [Error]: 267 = Inverter 1395 = DC section 1396 = AC grid	2	U32	Status	ENUM	RO
30257	DC switch in cabinet [DcSwStt]: 51 = Closed 311 = Open	2	U32	Status	ENUM	RO
30261	AC switch 1 in cabinet [AcSwStt]: 51 = Closed 311 = Open	2	U32	Status	ENUM	RO

30265	AC switch-disconnector in cabinet [DlnErrAcScir]: 51 = Closed 311 = Open	2	U32	Status	ENUM	RO
30535	Day yield (Wh) [E-heute]	2	U32	Scalar	FIX0	RO
30537	Day yield (kWh) [E-heute]	2	U32	Scalar	FIX0	RO
30539	Day yield (MWh) [E-heute]	2	U32	Scalar	FIX0	RO
30547	Operating hours interior fan 2 (s) [CntFanCab2]	2	U32	Scalar	Duration	RO
30549	Operating hours heat sink fan (s) [CntFanHs]	2	U32	Scalar	Duration	RO
30797	Grid current L1 (A) [IacL1]	2	U32	Scalar	FIX3	RO
30799	Grid current L2 (A) [IacL2]	2	U32	Scalar	FIX3	RO
30801	Grid current L3 (A) [IacL3]	2	U32	Scalar	FIX3	RO
30821	Current, average displacement power factor from active and reactive power, across all phases [PF]	2	U32	Scalar	FIX2	RO
30823	Excitation type of cos(Phi) [PFExt]: 973 = – 1041 = Overexcited 1042 = Underexcited	2	U32	Status	ENUM	RO
30825	Operating mode of reactive power regulation [Q-VArMod]: 303 = Off 1069 = Reactive power/Voltage characteristic curve Q(U) 1070 = Reactive power Q, direct default setting 1071 = Reactive power const. Q (kvar)	2	U32	Status	ENUM	RO

	1072 = Reactive power Q, default setting via plant control 1074 = cos(Phi), direct default setting 1075 = cos(Phi), default setting via plant control 1076 = cos(Phi)(P) – characteristic curve 1387 = Reactive power Q, default setting via analog input 1388 = cos(Phi), default setting via analog input 1389 = Reactive power/Voltage characteristic curve Q(U) with hysteresis and deadband					
30827	Reactive power target value (var) [Q-VAr]	2	S32	Scalar	FIX0	RO
30829	Reactive power target value (%) [Q-VArNom]	2	S32	Scalar	FIX1	RO
30831	Target value cos(Phi) [PF-PF]	2	S32	Scalar	FIX2	RO
30833	Target value excitation type of cos(Phi) [PF-PFExt]: 973 = – 1041 = Overexcited 1042 = Underexcited	2	U32	Status	ENUM	RO
30835	Operating mode of active power limitation [P-WMod]: 303 = Off 1077 = Active power limitation P (W) 1078 = Active power limitation P (% Pmax) 1079 = Active power limitation P via plant control 1390 = Active power limitation P via analog input	2	U32	Status	ENUM	RO

30839	Active power target value (%) [PWNom]	2	U32	Scalar	FIX0	RO
30841	AC voltages (average of all string voltages) (V) [Vac]	2	U32	Scalar	FIX2	RO
34101	Operating hours interior fan 2 (s) [CntFanCab2]	4	U64	Scalar	Duration	RO
34105	Operating hours heat sink fan (s) [CntFanHs]	4	U64	Scalar	Duration	RO
34115	Interior temperature 2 (°F) [TmpCab2]	2	S32	Scalar	TEMP	RO
34121	Transformer temperature 1 (°C) [TmpTrf]	2	S32	Scalar	TEMP	RO

7.3.6 Device Family SC nnnHE, SC nnnHE-10 and SC nnnHE-11

In the following table, you will find the measured values and parameters supported by the SC nnnHE, SC nnnHE-10 and SC nnnHE-11 device family, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16). The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33 also apply to this table:

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30225	Insulation resistance (ohms) [R-Insul]	2	U32	Scalar	FIX0	RO
30241	Operating state [Mode]: 295 = MPP 381 = Stop 1455 = Emergency stop 1466 = Waiting 1467 = Start 1468 = MPP search 1469 = Shut-down 1470 = Fault 1471 = Warning/Error mail OK 1472 = Warning/Error mail not OK 1473 = Plant information mail OK 1474 = Plant information mail not OK 1475 = Error mail OK 1476 = Error mail not OK 1477 = Warning mail OK 1478 = Warning mail not OK 1479 = Wait after grid interruption	2	U32	Status	ENUM	RO
30535	Day yield (Wh) [E-heute]	2	U32	Scalar	FIX0	RO
30537	Day yield (kWh) [E-heute]	2	U32	Scalar	FIX0	RO
30539	Day yield (MWh) [E-heute]	2	U32	Scalar	FIX0	RO

30821	Current, average displacement power factor from active power and reactive power, across all phases [PF]	2	U32	Scalar	FIX2	RO
30825	Operating mode of reactive power regulation [Q-VArMod]: 303 = Off 1069 = Reactive power/Voltage characteristic curve Q(U) 1070 = Reactive power Q, direct default setting 1071 = Reactive power const. Q (kvar) 1072 = Reactive power Q, default setting via plant control 1074 = cos(Phi), direct default setting 1075 = cos(Phi), default setting via plant control 1076 = cos(Phi)(P) – characteristic curve 1387 = Reactive power Q, default setting via analog input 1388 = cos(Phi), default setting via analog input	2	U32	Status	ENUM	RO
30827	Reactive power target value (var) [Q-VArSpt]	2	S32	Scalar	FIX0	RO
30831	Target value cos(Phi) [PF-PFSpt]	2	S32	Scalar	FIX2	RO
30833	Target value excitation type of cos(Phi) [PF-PFExtSpt]: 1041 = Overexcited 1042 = Underexcited	2	U32	Status	ENUM	RO
30835	Operating mode of active power limitation [P-WMod]: 303 = Off 1077 = Active power limitation P (W) 1078 = Active power limitation P (% Pmax) 1079 = Active power limitation P via plant control 1390 = Active power limitation P via analog input	2	U32	Status	ENUM	RO

31283	PV string current group 1 [Mittelwert Grp1]	2	S32	Scalar	FIX3	RO
31289	PV string current group 2 [Mittelwert Grp2]	2	S32	Scalar	FIX3	RO
31295	PV string current group 3 [Mittelwert Grp3]	2	S32	Scalar	FIX3	RO
32049	SSM ID for the communication fault has occurred [Komm.Fehler SMU]	2	U32	Scalar	FIX0	RO
32051	SMU warning code for string fault [SMU Warncode]	2	U32	Scalar	FIX0	RO
40009	Operating state [BF_Anlage Abf.]: 381 = Stop 569 = Switched on	2	U32	Status	ENUM	RW

7.3.7 Device Family SC nnnU

In the following table, you will find the measured values and parameters supported by the SC nnnU device family, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16). The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33 also apply to this table:

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30199	Time until grid connection attempt (s) [TmsRmg]	2	U32	Scalar	Duration	RO
30211	Recommended action [Prio]: 336 = Contact manufacturer service 337 = Contact installer 338 = Invalid	2	U32	Status	ENUM	RO
30217	Grid contactor [GdCtcStt]: 51 = Contactor closed 311 = Contactor open	2	U32	Status	ENUM	RO
30241	Operating state [mode]: 309 = Operation 455 = Warning 1392 = Error 1470 = Fault	2	U32	Status	ENUM	RO
30243	Error [Error]: 267 = Inverter 1395 = DC section 1396 = AC grid	2	U32	Status	ENUM	RO
30257	DC switch in cabinet [DcSwStt]: 51 = Closed 311 = Open	2	U32	Status	ENUM	RO
30261	AC switch 1 in cabinet [AcSwStt]: 51 = Closed 311 = Open	2	U32	Status	ENUM	RO

30265	AC switch-disconnector in cabinet [DlnErrAcScir]: 51 = Closed 311 = Open	2	U32	Status	ENUM	RO
30535	Day yield (Wh) [E-heute]	2	U32	Scalar	FIX0	RO
30537	Day yield (kWh) [E-heute]	2	U32	Scalar	FIX0	RO
30539	Day yield (MWh) [E-heute]	2	U32	Scalar	FIX0	RO
30547	Operating hours interior fan 2 (s) [CntFanCab2]	2	U32	Scalar	Duration	RO
30549	Operating hours heat sink fan (s) [CntFanHs]	2	U32	Scalar	Duration	RO
30797	Grid current L1 (A) [IacL1]	2	U32	Scalar	FIX3	RO
30799	Grid current L2 (A) [IacL2]	2	U32	Scalar	FIX3	RO
30801	Grid current L3 (A) [IacL3]	2	U32	Scalar	FIX3	RO
30835	Operating mode of active power limitation [P-WMod]: 303 = Off 1077 = Active power limitation P (W) 1078 = Active power limitation P (% Pmax) 1079 = Active power limitation P via plant control 1390 = Active power limitation P via analog input	2	U32	Status	ENUM	RO
30839	Active power target value (%) [PWNom]	2	U32	Scalar	FIX0	RO
30841	AC voltages (average of all string voltages) (V) [Vac]	2	U32	Scalar	FIX2	RO
34101	Operating hours interior fan 2 (s) [CntFanCab2]	4	U64	Scalar	Duration	RO
34105	Operating hours heat sink fan (s) [CntFanHs]	4	U64	Scalar	Duration	RO

34115	Interior temperature 2 (°F) [TmpCab2]	2	S32	Scalar	TEMP	RO
34121	Transformer temperature 1 (°C) [TmpTrf]	2	S32	Scalar	TEMP	RO

7.3.8 Device Family SI and SBU

In the following table, you will find the measured values and parameters supported by the SI and SBU device families, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16):

Address compatibility

The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33, do **not** apply to this device type!

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30051	Device class [MainModel]: 460 = Solar inverter	2	U32	Status	ENUM	RO
30057	Serial number [Serial Number]	2	U32	Scalar	RAW	RO
30061	Firmware [FwVer]	2	U32	Scalar	FW	RO
30063	Firmware [FwVer2]	2	U32	Scalar	FW	RO
30199	Time until grid connection attempt (s) [GdRmgTm]	2	U32	Scalar	Duration	RO
30201	Condition [Mode]: 35 = Fault 303 = Off 307 = OK 455 = Warning 973 = –	2	U32	Status	ENUM	RO
30211	Recommended action [Prio]: 336 = Contact manufacturer service 337 = Contact installer 338 = Invalid 973 = –	2	U32	Status	ENUM	RO
30229	Local time (s) [Tm]	2	U32	Scalar	DT	RO
30531	Total yield (kWh) [E-Total]	2	U32	Scalar	FIX0	RO
30541	Operating hours (s) [OnTmh]	2	U32	Scalar	Duration	RO
30543	Feed-in hours (s) [TotTmh]	2	U32	Scalar	Duration	RO

30565	Number of generator starts [GnStrCnt]	2	U32	Scalar	FIX0	RO
30567	Amp hours counter for battery charge (Ah) [AhCntIn]	2	U32	Scalar	FIX0	RO
30569	Amp hours counter for battery discharge (Ah) [AhCntOut]	2	U32	Scalar	FIX0	RO
30571	Meter reading consumption meter (Wh) [TotLodEgyCnt]	2	U32	Scalar	FIX0	RO
30573	Generator operating hours (s) [GnOpTmh]	2	U32	Scalar	Duration	RO
30575	Released generator power (Wh) [GnEgyCnt]	2	U32	Scalar	FIX0	RO
30577	Grid energy consumption today (Wh) [GdCsmpEgyTdy]	2	U32	Scalar	FIX0	RO
30579	Grid energy feed-in today (Wh) [GdFeedEgyTdy]	2	U32	Scalar	FIX0	RO
30581	Grid reference counter reading (Wh) [GdCsmpEgyMtr]	2	U32	Scalar	FIX0	RO
30583	Grid feed-in counter reading (Wh) [GdFeedEgyMtr]	2	U32	Scalar	FIX0	RO
30585	Power outage (s) [GdFailTms]	2	U32	Scalar	Duration	RO
30587	PV generation counter reading (Wh) [PvEgyMtr]	2	U32	Scalar	FIX0	RO
30589	Rise in self-consumption (Wh) [SlfCsmpIncEgy]	2	U32	Scalar	FIX0	RO
30591	Rise in self-consumption today (Wh) [SlfCsmpIncTdy]	2	U32	Scalar	FIX0	RO
30593	Energy consumed internally (Wh) [SlfCsmpEgy]	2	U32	Scalar	FIX0	RO
30595	Absorbed energy (Wh) [EgyCntIn]	2	U32	Scalar	FIX0	RO
30597	Released energy (Wh) [EgyCntOut]	2	U32	Scalar	FIX0	RO
30599	Number of grid connections [GdCtcCnt]	2	U32	Scalar	FIX0	RO
30775	Power (W) [TotInvPwrAt]	2	S32	Scalar	FIX0	RO

30777	Power L1 (W) [InvPwrAt]	2	S32	Scalar	FIX0	RO
30779	Power L2 (W) [InvPwrAtSlv1]	2	S32	Scalar	FIX0	RO
30781	Power L3 (W) [InvPwrAtSlv2]	2	S32	Scalar	FIX0	RO
30783	Grid voltage phase L1 (V) [InvVtg]	2	U32	Scalar	FIX2	RO
30785	Grid voltage phase L2 (V) [InvVtgSlv1]	2	U32	Scalar	FIX2	RO
30787	Grid voltage phase L3 (V) [InvVtgSlv2]	2	U32	Scalar	FIX2	RO
30795	Grid current (A) [TotInvCur]	2	U32	Scalar	FIX3	RO
30797	Grid current phase L1 (A) [InvCur]	2	U32	Scalar	FIX3	RO
30799	Grid current phase L2 (A) [InvCurSlv1]	2	U32	Scalar	FIX3	RO
30801	Grid current phase L3 (A) [InvCurSlv2]	2	U32	Scalar	FIX3	RO
30803	Grid frequency (Hz) [InvFrq]	2	U32	Scalar	FIX2	RO
30805	Reactive power (var) [TotInvPwrRt]	2	S32	Scalar	FIX2	RO
30807	Reactive power L1 (var) [InvPwrRt]	2	S32	Scalar	FIX0	RO
30809	Reactive power L2 (var) [InvPwrRtSlv1]	2	S32	Scalar	FIX0	RO
30811	Reactive power L3 (var) [InvPwrRtSlv2]	2	S32	Scalar	FIX0	RO
30843	Battery current (A) [TotBatCur]	2	S32	Scalar	FIX3	RO
30845	Current battery charge status (%) [BatSoc]	2	U32	Scalar	FIX0	RO
30847	Current battery capacity (%) [Soh]	2	U32	Scalar	FIX0	RO
30849	Battery temperature (°C) [BatTmp]	2	S32	Scalar	TEMP	RO
30851	Battery voltage (V) [BatVtg]	2	U32	Scalar	FIX2	RO

30853	Active battery charging mode [BatChrgOp]: 973 = – 1767 = Quick charge 1768 = Full charge 1769 = Compensation charge 1770 = Maintenance charge 2184 = Save energy while on mains	2	U32	Status	ENUM	RO
30855	Current battery charging set voltage (V) [BatChrgVtg]	2	U32	Scalar	FIX2	RO
30857	Number of battery charge throughputs [BatCpyThrpCnt]	2	S32	Scalar	FIX0	RO
30859	Battery maintenance charge status [BatMntStt]: 803 = Inactive 973 = – 1771 = Charge with solar power 1772 = Charge with solar and mains power	2	U32	Status	ENUM	RO
30861	Consumer power (W) [TotLodPwrAt]	2	S32	Scalar	FIX0	RO
30863	Current generator power (W) [TotGnPwrAt]	2	U32	Scalar	FIX0	RO
30865	Power grid reference (W) [GdCsmpPwrAt]	2	S32	Scalar	FIX0	RO
30867	Power grid feed-in (W) [GdFeedPwrAt]	2	S32	Scalar	FIX0	RO
30869	PV power generated (W) [TotPvPwr]	2	S32	Scalar	FIX0	RO
30871	Current self-consumption (W) [SlfCsmpPwrAt]	2	U32	Scalar	FIX0	RO
30873	Current rise in self-consumption (W) [SlfCsmpIncPwr]	2	S32	Scalar	FIX0	RO
30875	Multifunction relay status [Rly1Stt]: 51 = Closed 311 = Open 973 = –	2	U32	Status	ENUM	RO

30877	Power supply status [LodGdConStt]: 303 = Off 973 = – 1461 = Mains connected 1462 = Backup not available 1463 = Backup	2	U32	Status	ENUM	RO
30879	Reason for generator request [GnDmdSrc]: 46 = Battery 973 = – 1773 = No request 1774 = Load 1775 = Time control 1776 = Manual one hour 1777 = Manual start 1778 = External source	2	U32	Status	ENUM	RO
30881	PV mains connection [PvGdConStt]: 973 = – 1779 = Separated 1780 = Public electricity mains 1781 = Island mains	2	U32	Status	ENUM	RO
30883	Status public electricity mains [GdStt]: 303 = Off 973 = – 1392 = Fault 1394 = Waiting for valid AC grid 1461 = Mains connected 1466 = Wait 1787 = Initialisation 2183 = Mains operation without consumption 2184 = Save energy while on mains 2185 = Stop save energy while on mains 2186 = Start save energy while on mains	2	U32	Status	ENUM	RO

30885	Power external mains connection (W) [TotExtPwrAt]	2	U32	Scalar	FIX0	RO
30887	Power external mains connection phase A (W) [ExtPwrAt]	2	U32	Scalar	FIX0	RO
30889	Power external mains connection phase B (W) [ExtPwrAtSlv1]	2	U32	Scalar	FIX0	RO
30891	Power external mains connection phase C (W) [ExtPwrAtSlv2]	2	U32	Scalar	FIX0	RO
30893	Reactive power external mains connection (var) [TotExtPwrRt]	2	U32	Scalar	FIX0	RO
30895	Reactive power external mains connection phase A (var) [ExtPwrRt]	2	U32	Scalar	FIX0	RO
30897	Reactive power external mains connection phase B (var) [ExtPwrRtSlv1]	2	U32	Scalar	FIX0	RO
30899	Reactive power external mains connection phase C (var) [ExtPwrRtSlv2]	2	U32	Scalar	FIX0	RO
30901	Grid frequency external mains connection (Hz) [ExtFrq]	2	U32	Scalar	FIX2	RO
30903	Voltage external mains connection phase A (V) [ExtVtg]	2	U32	Scalar	FIX2	RO
30905	Voltage external mains connection phase B (V) [ExtVtgSlv1]	2	U32	Scalar	FIX2	RO
30907	Voltage external mains connection phase C (V) [ExtVtgSlv2]	2	U32	Scalar	FIX2	RO
30909	Current external mains connection phase A (A) [ExtCur]	2	S32	Scalar	FIX3	RO
30911	Current external mains connection phase B (A) [ExtCurSlv1]	2	S32	Scalar	FIX3	RO
30913	Current external mains connection phase C (A) [ExtCurSlv2]	2	S32	Scalar	FIX3	RO

30917	Generator status [GnStt]: 303 = Off 973 = – 1392 = Fault 1787 = Initialisation 1788 = Ready 1789 = Warming 1790 = Synchronisation 1791 = Activated 1792 = Resynchronisation 1793 = Generator separation 1794 = Slow down 1795 = Bolted 1796 = Blocked after error	2	U32	Status	ENUM	RO
40009	Operating condition [ManStr]: 381 = Stop 569 = Activated 973 = –	2	U32	Status	ENUM	RW
40011	Acknowledge fault [ErrAckn]: 26 = Acknowledge fault 973 = –	2	U32	Status	ENUM	RW
40031	Rated battery capacity (Ah) [BatCpyNom]	2	U32	Scalar	FIX0	RO
40033	Max. battery temperature (°C) [BatTmpMax]	2	U32	Scalar	TEMP	RW
40035	Battery type [BatTyp]: 973 = – 1782 = Sealed lead battery (VRLA) 1783 = Flooded lead acid batt. (FLA) 1784 = Nickel/Cadmium (NiCd) 1785 = Lithium-Ion (Li-Ion)	2	U32	Status	ENUM	RO
40037	Rated battery voltage (V) [BatVtgNom]	2	U32	Scalar	FIX0	RO
40039	Battery quick charge time (min) [AptTmBoost]	2	U32	Scalar	Duration	RW
40041	Battery compensation charge time (h) [AptTmEqu]	2	U32	Scalar	Duration	RW

40043	Battery full charge time (h) [AptTmFul]	2	U32	Scalar	Duration	RW
40045	Max. battery charging current (A) [BatChrgCurMax]	2	U32	Scalar	FIX3	RW
40047	Rated generator current (A) [GnCurNom]	2	U32	Scalar	FIX3	RW
40049	Automatic generator start [GnAutoEna]: 973 = – 1129 = Yes 1130 = No	2	U32	Status	ENUM	RW
40051	Generator shutdown battery charge limit (%) [GnSocTm1Stp]	2	U32	Scalar	FIX0	RW
40053	Generator startup battery charge limit (%) [GnSocTm1Str]	2	U32	Scalar	FIX0	RW
40055	Manual generator control [GnManStr]: 381 = Stop 973 = – 1438 = Automatic 1467 = Start 1776 = Manual one hour	2	U32	Status	ENUM	RW
40057	Generator request via power on [GnPwrEna]: 973 = – 1129 = Yes 1130 = No	2	U32	Status	ENUM	RW
40059	Generator shutdown load limit (W) [GnPwrStp]	2	U32	Scalar	FIX0	RW
40061	Generator startup load limit (W) [GnPwrStr]	2	U32	Scalar	FIX0	RW
40071	Grid creating generator [ExtSrc]: 973 = – 1799 = No 1801 = Mains 1802 = Mains and generator 1803 = Invalid configuration for the PV generation counter	2	U32	Status	ENUM	RW

40073	Lower discharging limit for rise in self-consumption (%) [SlfCsmpSOCMin]	2	U32	Scalar	FIX0	RW
40075	Rise in self-consumption switched on [SlfCsmpIncEna]: 973 = – 1129 = Ja 1130 = Nein	2	U32	Status	ENUM	RW
40077	Initiate device restart [InvRs]: 973 = – 1146 = Execute	2	U32	Status	ENUM	RW
40079	Charging stop voltage battery (V) [BatDiChgVtgMin]	2	U32	Scalar	FIX2	RW
40081	Maximum charging current battery (A) [BatChrgCurMax]	2	U32	Scalar	FIX3	RW
40083	Maximum discharging current battery (A) [BatDiChgCurMax]	2	U32	Scalar	FIX3	RW
40085	Target voltage per cell for quick charge (V) [ChrgVtgBoost]	2	U32	Scalar	FIX2	RW
40087	Target voltage per cell for full charge (V) [ChrgVtgFul]	2	U32	Scalar	FIX2	RW
40089	Target voltage per cell for compensation charge (V) [ChrgVtgEqu]	2	U32	Scalar	FIX2	RW
40091	Target voltage per cell for maintenance charge (V) [ChrgVtgFlo]	2	U32	Scalar	FIX2	RW
40093	Voltage monitoring upper minimum threshold (V) [GdVtgMin]	2	U32	Scalar	FIX2	RW
40095	Voltage monitoring upper maximum threshold (V) [GdVtgMax]	2	U32	Scalar	FIX2	RW
40097	Voltage monitoring hysteresis minimum threshold (V) [GdVtgMinDel]	2	U32	Scalar	FIX2	RW

40099	Voltage monitoring hysteresis maximum threshold (V) [GdVtgMaxDel]	2	U32	Scalar	FIX2	RW
40101	Frequency monitoring lower minimum threshold (Hz) [GdFrqMin]	2	U32	Scalar	FIX2	RW
40103	Voltage monitoring upper maximum threshold (Hz) [GdFrqMax]	2	U32	Scalar	FIX2	RW
40105	Frequency monitoring hysteresis minimum threshold (Hz) [GdFrqMinDel]	2	32	Scalar	FIX2	RW
40107	Frequency monitoring hysteresis maximum threshold (Hz) [GdFrqMaxDel]	2	32	Scalar	FIX2	RW
40109	Country standard set [Country]: 42 = AS4777.3 438 = VDE0126-1-1 973 = – 1013 = Other standard	2	U32	Status	ENUM	RO
40111	Voltage monitoring generator lower minimum threshold (V) [GnVtgMin]	2	U32	Scalar	FIX2	RW
40113	Voltage monitoring generator upper maximum threshold (V) [GnVtgMax]	2	U32	Scalar	FIX2	RW
40115	Voltage monitoring generator hysteresis minimum threshold (V) [GnVtgMinDel]	2	U32	Scalar	FIX2	RW
40117	Voltage monitoring generator hysteresis maximum threshold (V) [GnVtgMaxDel]	2	U32	Scalar	FIX2	RW
40119	Frequency monitoring generator lower minimum threshold (Hz) [GnFrqMin]	2	U32	Scalar	FIX2	RW
40121	Frequency monitoring generator upper maximum threshold (Hz) [GnFrqMax]	2	U32	Scalar	FIX2	RW

40123	Frequency monitoring generator hysteresis minimum threshold (Hz) [GnFrqMinDel]	2	U32	Scalar	FIX2	RW
40125	Frequency monitoring generator hysteresis maximum threshold (Hz) [GnFrqMaxDel]	2	U32	Scalar	FIX2	RW
40127	Voltage monitoring generator maximum reverse power (W) [GnRvPwr]	2	U32	Scalar	FIX2	RW
40129	Voltage monitoring generator maximum reverse power trigger time (s) [GnRvTm]	2	U32	Scalar	Duration	RW
40131	Grid connection point rated current (A) [GdCurNom]	2	U32	Scalar	FIX2	RW
40133	Grid nominal voltage (V) [GdVtgNom]	2	U32	Scalar	FIX0	RW
40135	Nominal frequency (Hz) [GdFrqNom]	2	U32	Scalar	FIX2	RW
40137	Acknowledge generator faults [GnAck]: 26 = Acknowledge fault 973 = –	2	U32	Status	ENUM	RW
40141	Max. start attempts after error [AutoStr]	2	U32	Scalar	FIX0	RW
40143	Active power specified by plant control (A) [FedInCurAtCom]	2	S32	Scalar	FIX2	RW
40145	Reactive power specified by plant control (A) [FedInCurRtCom]	2	S32	Scalar	FIX2	RW
40147	Generator active power limitation by plant control (A) [GnCurNomCom]	2	U32	Scalar	FIX2	RW

7.3.9 Device Family STP nn000TL-10

In the following table, you will find the measured values and parameters supported by the STP nn000TL-10 device family, which you can access under the Unit IDs = 3-247 (see section 5.1.1 “Information on Unit IDs”, page 16).

Address compatibility

The assignments in section 7.3.1 “Common Addresses of all SMA Devices”, page 33, do **not** apply to this device family!

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30051	Device class [MainModel]: 260 = Solar inverter	2	U32	Status	ENUM	RO
30053	Device-ID [Model]: 9067 = Sunny Tripower 10000TL-10 9068 = Sunny Tripower 12000TL-10 9069 = Sunny Tripower 15000TL-10 9070 = Sunny Tripower 17000TL-10 9101 = Sunny Tripower 8000TL-10	2	U32	Status	ENUM	RO
30057	Serial number [SerNumSet]	2	U32	Scalar	RAW	RO
30197	Event ID of the current event (number of digits is limited by device) [Op.EvtNo]; see also chapter “Troubleshooting”.	2	U32	Scalar	FIX0	RO
30199	Time until grid connection attempt (s) [Op.TmsRmg]	2	U32	Scalar	Duration	RO
30201	Condition [Op.Health]: 35 = Fault 307 = OK 455 = Warning	2	U32	Status	ENUM	RO

30211	Recommended action [Op.Prio]: 336 = Contact manufacturer service 337 = Contact installer 338 = Invalid 887 = None	2	U32	Status	ENUM	RO
30217	Grid contactor [Op.GriSwStt]: 51 = Contactor closed 311 = Contactor open	2	U32	Status	ENUM	RO
30219	Temperature derating [Inv.TmpLimStt]: 557 = Regulation due to temperature 884 = Not active	2	U32	Status	ENUM	RO
30225	Insulation resistance (ohms) [Riso]	2	U32	Scalar	FIX0	RO
30231	Maximum permanent active power, set unchangeable. Can be higher than the rated power (W) [Plimit]	2	U32	Scalar	FIX0	RO
30233	Permanent active power limitation (W) [Pmax]	2	U32	Scalar	FIX0	RO
30513	Total yield (Wh) [E-Total]	4	U64	Scalar	FIX0	RO
30521	Operating hours (s) [Mt.TotTmh]	4	U64	Scalar	Duration	RO
30525	Feed-in hours (s) [Mt.TotOpTmh]	4	U64	Scalar	Duration	RO
30529	Total yield (Wh) [E-Total]	2	U32	Scalar	FIX0	RO
30531	Total yield (kWh) [E-Total]	2	U32	Scalar	FIX0	RO
30533	Total yield (MWh) [E-Total]	2	U32	Scalar	FIX0	RO
30541	Operating hours (s) [Mt.TotTmh]	2	U32	Scalar	Duration	RO
30543	Feed-in hours (s) [Mt.TotOpTmh]	2	U32	Scalar	Duration	RO

30559	Number of events for user [Op.EvtCntUsr]	2	U32	Scalar	FIX0	RO
30561	Number of events for installer [Op.EvtCntIstl]	2	U32	Scalar	FIX0	RO
30563	Number of events for service [Op.EvtCntSvc]	2	U32	Scalar	FIX0	RO
30769	DC current input (A) [A.Ms.Amp]	2	S32	Scalar	FIX3	RO
30771	DC voltage input (V) [A.Ms.Vol]	2	S32	Scalar	FIX2	RO
30773	DC power input (W) [A.Ms.Watt]	2	S32	Scalar	FIX0	RO
30775	AC active power across all phases (W) [Pac]	2	S32	Scalar	FIX0	RO
30777	Power L1 (W) [GridMs.W.phsA]	2	S32	Scalar	FIX0	RO
30779	Power L2 (W) [GridMs.W.phsB]	2	S32	Scalar	FIX0	RO
30781	Power L3 (W) [GridMs.W.phsC]	2	S32	Scalar	FIX0	RO
30783	Grid voltage phase L1 to N (V) [GridMs.PhV.phsA]	2	U32	Scalar	FIX2	RO
30785	Grid voltage phase L2 to N (V) [GridMs.PhV.phsB]	2	U32	Scalar	FIX2	RO
30787	Grid voltage phase L3 to N (V) [GridMs.PhV.phsC]	2	U32	Scalar	FIX2	RO
30797	Grid current phase L1 (A) [GridMs.A.phsA]	2	U32	Scalar	FIX3	RO
30799	Grid current phase L2 (A) [GridMs.A.phsB]	2	U32	Scalar	FIX3	RO
30801	Grid current phase L3 (A) [GridMs.A.phsC]	2	U32	Scalar	FIX3	RO
30803	Power frequency (Hz) [GridMs.Hz]	2	U32	Scalar	FIX2	RO
30805	Reactive power (var) [GridMs.TotVAr]	2	S32	Scalar	FIX2	RO
30807	Reactive power L1 (var) [GridMs.VAr.phsA]	2	S32	Scalar	FIX0	RO

30809	Reactive power L2 (var) [GridMs.VAr.phsB]	2	S32	Scalar	FIX0	RO
30811	Reactive power L3 (var) [GridMs.VAr.phsC]	2	S32	Scalar	FIX0	RO
30813	Total apparent power (VA) [GridMs.TotVA]	2	S32	Scalar	FIX0	RO
30815	Apparent power L1 (VA) [GridMs.VA.phsA]	2	S32	Scalar	FIX0	RO
30817	Apparent power L2 (VA) [GridMs.VA.phsB]	2	S32	Scalar	FIX0	RO
30819	Apparent power L3 (VA) [GridMs.VA.phsC]	2	S32	Scalar	FIX0	RO
30825	Operating mode of reactive power regulation [Q-VArMod]: 303 = Off 1069 = Reactive power/Voltage characteristic curve Q(U) 1070 = Reactive power Q, direct default setting 1072 = Reactive power Q, default setting via plant control 1074 = cos(Phi), direct default setting 1075 = cos(Phi), default setting via plant control 1076 = cos(Phi)(P) – characteristic curve	2	U32	Status	ENUM	RO
30829	Reactive power target value (%) [Q-VArNom]	2	S32	Scalar	FIX1	RO
30831	Target value cos(Phi) [PF-PF]	2	S32	Scalar	FIX2	RO
30833	Target value excitation type of cos(Phi) [PF-PFExt]: 973 = – 1041 = Overexcited 1042 = Underexcited	2	U32	Status	ENUM	RO

30835	Operating mode of active power limitation [P-WMod]: 303 = Off 1077 = Active power limitation P (W) 1078 = Active power limitation P (% Pmax) 1079 = Active power limitation P via plant control	2	U32	Status	ENUM	RO
30837	Active power target value (W) [P-W]	2	U32	Scalar	FIX0	RO
30839	Active power target value (%) [P-WNom]	2	U32	Scalar	FIX0	RO
31793	String current, string 1 (A) [A1.Ms.Amp]	2	S32	Scalar	FIX3	RO
31795	String current, string 2 (A) [A2.Ms.Amp]	2	S32	Scalar	FIX3	RO
31797	String current, string 3 (A) [A3.Ms.Amp]	2	S32	Scalar	FIX3	RO
31799	String current, string 4 (A) [A4.Ms.Amp]	2	S32	Scalar	FIX3	RO
31801	String current, string 5 (A) [A5.Ms.Amp]	2	S32	Scalar	FIX3	RO
31803	String current, string 6 (A) [B1.Ms.Amp]	2	S32	Scalar	FIX3	RO
35377	Number of events for user [Op.EvtCntUsr]	4	U64	Scalar	FIX0	RO
35381	Number of events for installer [Op.EvtCntIstl]	4	U64	Scalar	FIX0	RO
35385	Number of events for service [Op.EvtCntSvc]	4	U64	Scalar	FIX0	RO
40009	Operating state [Op.OpModSet]: 295 = MPP 381 = Stop 569 = Switched on	2	U32	Status	ENUM	RW
40204	Reactive power setpoint (%)	2	S32	Scalar	FIX1	RW
40206	cosPhi setpoint, cosPhi configuration, direct specification	2	S32	Scalar	FIX2	RW

40208	cosPhi excitation type, cosPhi configuration, direct specification	2	U32	Status	ENUM	RW
40212	Active power limitation P, active power configuration (W)	2	U32	Scalar	FIX0	RW
40214	Active power limitation P, active power configuration (%)	2	U32	Scalar	FIX0	RW

7.3.10 Optiprotect

In the following table, you will find the measured values and parameters supported by the Optiprotect, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16).

Address compatibility

The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33, do **not** apply to this device type!

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30051	Device class [MainModel]: 8001 = Sensor system general	2	U32	Status	ENUM	RO
30057	Serial number SMID-CONT [Serial Number]	2	U32	Scalar	RAW	RO
30061	Firmware SMID-CONT [Firmware]	2	U32	Scalar	FW	RO
30063	Boot loader SMID-CONT [Firmware-2]	2	U32	Scalar	FW	RO
30065	Firmware SMID-CT1 [Firmware-3]	2	U32	Scalar	FW	RO
30067	Boot loader SMID-CT1 [Firmware-4]	2	U32	Scalar	FW	RO
30069	Firmware SMID-CT2 [Firmware-5]	2	U32	Scalar	FW	RO
30071	Boot loader SMID-CT2 [Firmware-6]	2	U32	Scalar	FW	RO
30073	Firmware SMID-CT3 [Firmware-7]	2	U32	Scalar	FW	RO
30075	Boot loader SMID-CT3 [Firmware-8]	2	U32	Scalar	FW	RO
30077	Firmware SMID-CT4 [Firmware-9]	2	U32	Scalar	FW	RO
30079	Boot loader SMID-CT4 [Firmware-10]	2	U32	Scalar	FW	RO
30097	Serial number SMID-CT1 [Serial Number-1]	2	U32	Scalar	RAW	RO

30099	Serial number SMID-CT2 [Serial Number-2]	2	U32	Scalar	RAW	RO
30101	Serial number SMID-CT3 [Serial Number-3]	2	U32	Scalar	RAW	RO
30103	Serial number SMID-CT4 [Serial Number-4]	2	U32	Scalar	RAW	RO
30193	Reading of the plant time (UTC) [SerTm]	2	U32	Scalar	DT	RO
30195	Reading of the time zone (UTC) [TmZn]: For possible values, see section "Return Codes for Time Zones", page 92.	2	U32	Scalar	ENUM	RO
30197	Event ID of the current event (number of digits is limited by the device) [ErrNo]; see also chapter "Troubleshooting".	2	U32	Scalar	FIX0	RO
30199	Time until grid connection attempt (s) [TmsRmg]	2	U32	Scalar	Duration	RO
30211	Recommended action [Prio]: 336 = Contact manufacturer service 337 = Contact installer 338 = Invalid	2	U32	Status	ENUM	RO
30225	Insulation resistance (ohms) [Riso]	2	U32	Scalar	FIX0	RO
30241	Operating state [Mode]: 309 = Operation 455 = Warning 1392 = Error	2	U32	Status	ENUM	RO
30243	Error [Error]: 267 = Inverter 1395 = DC section 1396 = AC grid	2	U32	Status	ENUM	RO

30267 to 30297	SMID DC switch 1 to 16 [DcSwStt1.1] to [DcSwStt4.4]: 51 = closed 311 = opened 1694 = has triggered	2	U32	Status	ENUM	RO
30331 to 30361	Error message SMID DC switch 1 to 16 [DcSwErr1.1] to [DcSwErr4.4] 1508 = 90 % of the DC-switching cycles reached 1509 = 100 % of the DC switching times reached 1695 = DC switch waits for connection 1696 = DC switch blocked by spindle 1697 = DC switch manually blocked 1698 = DC switch triggered 3 times 1699 = DC switch defective	2	U32	Status	ENUM	RO
30771	DC voltage (V) [Vpv]	2	S32	Scalar	FIX2	RO
31791	Number of DC current measurement units [CTNoOf]	2	U32	Scalar	FIX0	RO
31793 to 31855	String current 1 to 32 (A) [Ipv1.1.B] to [Ipv4.4.B]	2	S32	Scalar	FIX3	RO

32057 to 32119	Status of the monitored strings 1 to 32 [DcInStt1.1.B] to [DcInStt4.4.B]: 307 = OK 467 = DC overvoltage 477 = Reverse current 1492 = String temporarily deselected due to earth fault 1493 = String permanently deselected due to earth fault 1649 = String x has low power 1650 = Partial string x has low power 1692 = String deactivated due to power reduction 1693 = No string connected	2	U32	Status	ENUM	RO
40001	Setting of the plant time (UTC) [SerTm]	2	U32	Scalar	DT	RW
40003	Setting of the time zone [TmZn]. For possible values, see section "Return Codes for Time Zones", page 92.	2	U32	Status	ENUM	RW
40011	Acknowledgement: 26 = Acknowledge fault	2	U32	Status	ENUM	RW

7.3.11 Sunny String-Monitor

In the following table, you will find the measured values and parameters supported by the Sunny String-Monitor, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16).

Address compatibility

The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33, do **not** apply to this device type!

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30057	Serial number [Seriennummer]	2	U32	Scalar	RAW	RO
30245	SMU ID [SSM Identifier]	2	U32	Scalar	FIX0	RO
31793	String current of the string 1 of an SMU/SMID (A) [IString 1]	2	S32	Scalar	FIX3	RO
31795	String current of the string 2 of an SMU/SMID (A) [IString 2]	2	S32	Scalar	FIX3	RO
31797	String current of the string 3 of an SMU/SMID (A) [IString 3]	2	S32	Scalar	FIX3	RO
31799	String current of the string 4 of an SMU/SMID (A) [IString 4]	2	S32	Scalar	FIX3	RO
31801	String current of the string 5 of an SMU/SMID (A) [IString 5]	2	S32	Scalar	FIX3	RO
31803	String current of the string 6 of an SMU/SMID (A) [IString 6]	2	S32	Scalar	FIX3	RO
31805	String current of the string 7 of an SMU/SMID (A) [IString 7]	2	S32	Scalar	FIX3	RO
31807	String current of the string 8 of an SMU/SMID (A) [IString 8]	2	S32	Scalar	FIX3	RO

32053	Status of signal contact 1 [Signal contact 1]: 303 = Off 308 = On	2	U32	Status	ENUM	RO
32055	Status of signal contact 2 [Signal contact 2]: 303 = Off 308 = On	2	U32	Status	ENUM	RO

7.3.12 Sunny Central String-Monitor Controller

In the following table, you will find the measured values and parameters supported by the Sunny String-Monitor Controller, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16).

Address compatibility

The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33, do **not** apply to this device type!

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30057	Serial number [Serial Number]	2	U32	Scalar	RAW	RO
30197	Event ID of the current event (number of digits is limited by the device); see also chapter "Troubleshooting".	2	U32	Scalar	FIX0	RO
30241	Operating state [mode]: 309 = Operation 455 = Warning 1392 = Error 1470 = Fault	2	U32	Status	ENUM	RO
30521	Operating hours (s) [h-On]	4	U64	Scalar	Duration	RO
30541	Operating hours (s) [h-on]	2	U32	Scalar	Duration	RO
31283	PV string current group 1 (A) [MeanCurGr1]	2	S32	FIX3	Scalar	RO
31289	PV string current group 2 (A) [MeanCurGr2]	2	S32	FIX3	Scalar	RO
31295	PV string current group 3 (A) [MeanCurGr3]	2	S32	FIX3	Scalar	RO
31301	PV string current group 4 (A) [MeanCurGr4]	2	S32	FIX3	Scalar	RO
31307	PV string current group 5 (A) [MeanCurGr5]	2	S32	FIX3	Scalar	RO
31313	PV string current group 6 (A) [MeanCurGr6]	2	S32	FIX3	Scalar	RO
32051	SMU warning code for string error [SSMUWrnCode]	2	U32	FIX0	Scalar	RO

7.3.13 Sunny Central String-Monitor-US

In the following table, you will find the measured values and parameters supported by the Sunny Central String-Monitor-US, which you can access under the Unit IDs = 3-247 (see section 5.1.1 “Information on Unit IDs”, page 16).

Address compatibility

The assignments in section 7.3.1 “Common Addresses of all SMA Devices”, page 33, do **not** apply to this device type!

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30057	Serial number [Serial Number]	2	U32	Scalar	RAW	RO
30241	Operating state [Mode]: 309 = Operation 455 = Warning 1392 = Fault 1470 = Disruption	2	U32	Status	ENUM	RO
30245	SMU ID [SSMId]	2	U32	Scalar	FIX0	RO
31793	String current of the string 1 of an SMU/SMID (A) [CurCh1]	2	S32	Scalar	FIX3	RO
31795	String current of the string 2 of an SMU/SMID (A) [CurCh2]	2	S32	Scalar	FIX3	RO
31797	String current of the string 3 of an SMU/SMID (A) [CurCh3]	2	S32	Scalar	FIX3	RO
31799	String current of the string 4 of an SMU/SMID (A) [CurCh4]	2	S32	Scalar	FIX3	RO
31801	String current of the string 5 of an SMU/SMID (A) [CurCh5]	2	S32	Scalar	FIX3	RO
31803	String current of the string 6 of an SMU/SMID (A) [CurCh6]	2	S32	Scalar	FIX3	RO
31805	String current of the string 7 of an SMU/SMID (A) [CurCh7]	2	S32	Scalar	FIX3	RO
31807	String current of the string 8 of an SMU/SMID (A) [CurCh8]	2	S32	Scalar	FIX3	RO

7.3.14 SMA Meteo Station

In the following table, you will find the measured values and parameters supported by the SMA Meteo Station, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16).

Address compatibility

The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33, do **not** apply to this device type!

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30051	Device class [MainModel]: 8001 = Sensor system general	2	U32	Status	ENUM	RO
30241	Operating status [Stat]: 455 = Warning 1392 = Error 1787 = Initialisation	2	U32	Status	ENUM	RO
30243	Error [Stat]: 503 = Fault sensor ambient temperature 1006 = Unknown error 1118 = Calibration failed 1835 = Fault sensor module temperature 1836 = Fan life-time reached 1837 = Error in pyranometer 1838 = Pyranometer calibration necessary	2	U32	Status	ENUM	RO
30521	Operating hours (s) [SMA h-On]	4	U64	Scalar	Duration	RO
34609	Environment temperature (°C) [TmpAmb C]	2	S32	Scalar	TEMP	RO
34613	Total irradiation on sensor surface (W/m²) [IntSolIrr]	2	U32	Scalar	FIX0	RO
34615	Wind speed (m/s) [WindVel m/s]	2	U32	Scalar	FIX1	RO
34617	Relative humidity (%) [envhmdt]	2	U32	Scalar	FIX2	RO

34619	Air pressure (Pa) [envpress]	2	U32	Scalar	FIX2	RO
34621	PV module temperature (°C) [TmpMdul C]	2	S32	Scalar	TEMP	RO
34625	Environment temperature (°F) [TmpAmb F]	2	S32	Scalar	TEMP	RO
34627	Environment temperature (K) [TmpAmb K]	2	S32	Scalar	TEMP	RO
34629	PV module temperature (°F) [TmpMdul F]	2	S32	Scalar	TEMP	RO
34631	PV module temperature (K) [TmpMdul K]	2	S32	Scalar	TEMP	RO
34633	Wind speed (km/s) [WindVel km/s]	2	U32	Scalar	FIX1	RO
34635	Wind speed (mph) [WindVel mph]	2	U32	Scalar	FIX1	RO

7.3.15 Sunny Sensorbox

In the following table, you will find the measured values and parameters supported by the Sunny Sensorbox, which you can access under the Unit IDs = 3-247 (see section 5.1.1 "Information on Unit IDs", page 16).

Address compatibility

The assignments in section 7.3.1 "Common Addresses of all SMA Devices", page 33, do **not** apply to this device type!

ADR (DEC)	Description/Return code	CNT (2 bytes)	Format	Display	Type	Access
30051	Device class [MainModel]: 8001 = Sensor system general	2	U32	Status	ENUM	RO
30521	Operating hours (s) [SMA h-On]	4	U64	Scalar	Duration	RO
34609	Environment temperature (°C) [TmpAmb C]	2	S32	Scalar	TEMP	RO
34613	Total irradiation on sensor surface (W/m²) [IntSolIrr]	2	U32	Scalar	FIX0	RO
34615	Wind speed (m/s) [WindVel m/s]	2	U32	Scalar	FIX1	RO
34621	PV module temperature (°C) [TmpMdul C]	2	S32	Scalar	TEMP	RO
34623	Total irradiation on external sensor / pyranometer (W/m²) [ExlSolIrr]	2	U32	Scalar	FIX0	RO
34625	Environment temperature (°F) [TmpAmb F]	2	S32	Scalar	TEMP	RO
34627	Environment temperature (K) [TmpAmb K]	2	S32	Scalar	TEMP	RO
34629	PV module temperature (°F) [TmpMdul F]	2	S32	Scalar	TEMP	RO
34631	PV module temperature (K) [TmpMdul K]	2	S32	Scalar	TEMP	RO
34633	Wind speed (km/s) [WindVel km/s]	2	U32	Scalar	FIX1	RO
34635	Wind speed (mph) [WindVel mph]	2	U32	Scalar	FIX1	RO

8 Troubleshooting

For troubleshooting please use the event numbers provided by the devices under the Modbus address 30197.

Event numbers cannot be decoded by return codes

The event numbers are device-specific. You cannot decode the event numbers using the return codes listed in the section "General Return Codes ", page 93.

- For breakdown of the event numbers and of the message numbers please use the operating instructions of the device

You can find further information for error analysis of the SMA Modbus profile in chapter “Reading and Writing Data in Modbus Protocol“, page 28.

9 Technical Data

9.1 Supported SMA Devices

SMA Modbus Profile version

Starting with SC-COM firmware version 1.1 and with Sunny WebBox firmware version 1.53, the SMA Modbus Profile can be updated at the data loggers with a separate XML file. The separate XML file has a profile version. With profile version 1.30 the device-IDs assigned until now will change. Please take a look at the profile version and device-ID at all of the following SMA devices listed hereafter.

This document applies only for the following SMA devices:

Data loggers:

- Sunny Central Communication Controller (SC-COM) with firmware version 1.0 or higher, device-ID = 188
- Sunny WebBox with firmware version 1.52 or higher, device-ID = 47

Backup Systems:

- Sunny Backup:
  - SBU2200, device-ID = 67, model = 9155
  - SBU5000, device-ID = 69, model = 9157

Inverters:

- Device family SB n000US, (firmware version 01.21.00.R, or higher):
  - Sunny Boy 5000US, device-ID = 268, model = 9044
  - Sunny Boy 6000US, device-ID = 268, model = 9047
  - Sunny Boy 7000US, device-ID = 268, model = 9053
  - Sunny Boy 8000US, device-ID = 268, model = 9083
- Device family SB nn000TL-US-12, (firmware version 01.90.00.R, or higher):
  - Sunny Boy 6000TL-US-12, device-ID = 269, model = 9153
  - Sunny Boy 7000TL-US-12, device-ID = 269, model = 9152
  - Sunny Boy 8000TL-US-12, device-ID = 269, model = 9148
  - Sunny Boy 9000TL-US-12, device-ID = 269, model = 9149
  - Sunny Boy 10000TL-US-12, device-ID = 269, model = 9150
  - Sunny Boy 11000TL-US-12, device-ID = 269, model = 9151
- Device family SC nnnCP and SC nnnHE-20:
  - Sunny Central 500CP (firmware version 01.13.07.R or higher), device-ID = 160, model = 9088. From profile version 1.30 on, device-ID = 122
  - Sunny Central 500CP-JP (firmware version 01.18.25.R, or higher), device-ID = 253, model = 9206. From profile version 1.30 on, device-ID = 122

- Sunny Central 500CP-US (firmware version 01.16.16.R, or higher), device-ID = 262, model = 9215. From profile version 1.30 on, device-ID = 122
- Sunny Central 500CP-US 600V (firmware version 01.16.16.R, or higher), device-ID = 271, model = 9221. From profile version 1.30 on, device-ID = 122
- Sunny Central 500HE-20 (firmware version 01.15.41.R or higher), device-ID = 202, model = 9123. From profile version 1.30 on, device-ID = 122
- Sunny Central 630CP (firmware version 01.13.07.R or higher), device-ID = 159, model = 9089. From profile version 1.30 on, device-ID = 122
- Sunny Central 630CP-US (firmware version 01.16.16.R, or higher), device-ID = 261, model = 9214. From profile version 1.30 on, device-ID = 122
- Sunny Central 630HE-20 (firmware version 01.15.41.R or higher), device-ID = 201, model = 9122. From profile version 1.30 on, device-ID = 122
- Sunny Central 720CP (firmware version 01.13.07.R or higher), device-ID = 165, model = 9095. From profile version 1.30 on, device-ID = 122
- Sunny Central 720CP-US (firmware version 01.16.16.R, or higher), device-ID = 263, model = 9216. From profile version 1.30 on, device-ID = 122
- Sunny Central 720HE-20 (firmware version 01.15.41.R or higher), device-ID = 203, model = 9124. From profile version 1.30 on, device-ID = 122
- Sunny Central 750CP-US (firmware version 01.16.16.R, or higher), device-ID = 264, model = 9217. From profile version 1.30 on, device-ID = 122
- Sunny Central 760CP (firmware version 01.13.07.R or higher), device-ID = 164, model = 9094. From profile version 1.30 on, device-ID = 122
- Sunny Central 760HE-20 (firmware version 01.15.41.R or higher), device-ID = 204, model = 9125. From profile version 1.30 on, device-ID = 122
- Sunny Central 800CP (firmware version 01.13.07.R or higher), device-ID = 158, model = 9090. From profile version 1.30 on, device-ID = 122
- Sunny Central 800CP-US (firmware version 01.16.16.R, or higher), device-ID = 260, model = 9213. From profile version 1.30 on, device-ID = 122
- Sunny Central 800HE-20 (firmware version 01.15.41.R or higher), device-ID = 200, model = 9121. From profile version 1.30 on, device-ID = 122
- Sunny Central 850CP (firmware version 01.13.07.R, or higher), device-ID = 254, model = 9207. From profile version 1.30 on, device-ID = 122
- Sunny Central 900CP (firmware version 01.13.07.R, or higher), device-ID = 255, model = 9208. From profile version 1.30 on, device-ID = 122

• Device family SC nnnHE, SC nnnHE-10 and SC nnnHE-11, (firmware version 2.10 or higher):
  - Sunny Central 250HE, device-ID = 230, model = 9175. From profile version 1.30 on, device-ID = 107
  - Sunny Central 400HE-11, device-ID = 228, model = 9170. From profile version 1.30 on, device-ID = 107

- Sunny Central 500HE-10, device-ID = 227, model = 9169. From profile version 1.30 on, device-ID = 107
- Sunny Central 500HE-11, device-ID = 227, model = 9169. From profile version 1.30 on, device-ID = 107
- Sunny Central 630HE-11, device-ID = 166, model = 9168. From profile version 1.30 on, device-ID = 107

- Device family SC nnnHE-US:
  - Sunny Central 500HE-US (firmware version 1.060 or higher), device-ID = 157, model = 9093. From profile version 1.30 on, device-ID = 87
- Device family SC nnnU, (firmware version 1.060 or higher):
  - Sunny Central 250-US, device-ID = 155, model = 9091. From profile version 1.30 on, device-ID = 87
  - Sunny Central 500-US, device-ID = 156, model = 9092. From profile version 1.30 on, device-ID = 87
- Device family STP nn000TL-10, (firmware version 2.22.10.R or higher):
  - Sunny Tripower 8000TL-10, device-ID = 128, model = 9101
  - Sunny Tripower 10000TL-10, device-ID = 128, model = 9067
  - Sunny Tripower 12000TL-10, device-ID = 128, model = 9068
  - Sunny Tripower 15000TL-10, device-ID = 128, model = 9069
  - Sunny Tripower 17000TL-10, device-ID = 128, model = 9070

Island inverters:

- Sunny Island:
  - SI 2012, device-ID = 67, model = 9155
  - SI 2224, device-ID = 67, model = 9158
  - SI 5048, device-ID = 69, model = 9159
  - SI4548-US-10, device-ID = 69, model = 9159
  - SI6048-US-10, device-ID = 69, model = 9159
  - SI6.0H-10, device-ID = 137, model = 9159
  - SI8.0H-10, device-ID = 137, model = 9159

String monitoring devices:

- Optiprotect (firmware version 1.00 or higher), device-ID = 198, model = 9120. From profile version 1.30 on, device-ID = 161
- Sunny Central String-Monitor Controller (firmware version 1.05 or higher), device-ID = 187, model = 9108. From profile version 1.30 on, device-ID = 129
- Sunny Central String-Monitor-US (firmware version 1.04 or higher), device-ID = 190, model = 9110. From profile version 1.30 on, device-ID = 97
- Sunny String-Monitor (firmware version 1.04 or higher), device-ID = 171

Weather stations:

- SMA Meteo Station (firmware version 1.00 or higher), device-ID = 232, model = 9176
- Sunny Sensorbox (firmware version 1.00 or higher), device-ID = 81, model = 9061

9.2 Modbus Communication Port

Communication port	Factory setting
TCP	502

Use a free communication port!

You should only use free communication ports. Generally, the following range of ports is available: 49152 to 65535

You can find further information about used ports under [IANA].

9.3 Modbus Reaction Time

This section contains typical reaction times for different inverter families. The reaction time is the interval within which changes in value are available in the SMA devices at the Modbus interface of the data logger. Consequently, changes in value can only be displayed in a corresponding or larger interval in your Modbus master system (e.g. in a SCADA system).

Device Family	Reaction Time (s) Sunny WebBox	Reaction Time (s) SC-COM
SC nnnCP and SC nnnHE-20	8 to 10	1
SC nnnU	8 to 10	1
SC nnnHE-US	8 to 10	1
SC nnnHE-11	8 to 10 (with 1-2 inverters per Sunny WebBox)	1
String Monitoring Unit (provides 5-minute mean values)	300	300

9.4 Interval of Data Request and Number of Values

Limit of data processing capabilities

Due to reasons of system stability the period between data requests via the Modbus protocol should be at least 10 seconds, whereby not more than 30 values should be requested. This specification is the upper limit for SMA devices controlled through the Modbus protocol, according to chapter “Number of SMA Devices”.

9.5 Number of SMA Devices

Recommended number of SMA devices

For performance reasons, we recommend operating only approx. 25 Modbus-capable SMA devices on the data logger and not to fully utilize the maximum possible number of 50 SMA devices that the data logger can handle.

9.6 Return Codes for Time Zones

In the following table, you will find an overview of the most important time zones and their numerical codes. In the tables of section "SMA Modbus Profile – Assignment Tables", from page 29, the return codes of the time zones are referenced at various locations. Here, you can determine the corresponding numerical code for the present time zone and use this to specify the time zone.

973 –
9500 (UTC+04:30) Kabul
9501 (UTC-09:00) Alaska
9502 (UTC+03:00) Kuwait, Er Riad
9503 (UTC+04:00) Abu Dhabi, Muscat
9504 (UTC+03:00) Baghdad
9505 (UTC-04:00) Atlantic (Canada)
9506 (UTC+09:30) Darwin
9507 (UTC+10:00) Canberra, Melbourne, Sydney
9508 (UTC+04:00) Baku
9509 (UTC-01:00) Azores
9510 (UTC-06:00) Saskatchewan
9511 (UTC-01:00) Cape Verde Islands
9512 (UTC+04:00) Yerevan
9513 (UTC+09:30) Adelaide
9515 (UTC+06:00) Astana, Dhaka
9516 (UTC-04:00) Manaus
9517 (UTC+01:00) Belgrade, Bratislava, Budapest, Ljubljana, Prague
9518 (UTC+01:00) Sarajevo, Skopje, Warsaw, Zagreb
9519 (UTC+11:00) Magadan, Solomon Islands, New Caledonia
9520 (UTC-06:00) Central America
9521 (UTC-06:00) Guadalajara, Mexico City, Monterrey - old
9522 (UTC+08:00) Beijing, Chongqing, Hong Kong, Ürümqi
9523 (UTC-12:00) International Date Line (West)
9524 (UTC+03:00) Nairobi
9525 (UTC+10:00) Brisbane
9526 (UTC+02:00) Minsk
9527 (UTC-03:00) Brasilia
9528 (UTC-05:00) New York, Miami, Atlanta, Detroit, Toronto
9529 (UTC+02:00) Cairo
9530 (UTC+05:00) Yekaterinburg
9531 (UTC+12:00) Fiji, Marshall Islands
9532 (UTC+02:00) Helsinki, Kyiv, Riga, Sofia, Tallinn, Vilnius
9534 (UTC) Dublin, Edinburgh, Lisbon, London
9535 (UTC-03:00) Greenland
9536 (UTC) Monrovia, Reykjavík
9537 (UTC+02:00) Athens, Bucharest, Istanbul
9538 (UTC-10:00) Hawaii
9539 (UTC+05:30) Chennai, Kolkata, Mumbai, New-Delhi
9540 (UTC+03:30) Tehran
9541 (UTC+02:00) Jerusalem
9542 (UTC+02:00) Amman
9543 (UTC+09:00) Seoul
9544 (UTC+08:00) Kuala Lumpur, Singapore
9545 (UTC-02:00) Mid Atlantic
9546 (UTC+02:00) Beirut
9547 (UTC-07:00) Denver, Salt Lake City, Calgary
9548 (UTC-07:00) Chihuahua, La Paz, Mazatlan - old
9549 (UTC+06:30) Yangon (Rangoon)
9550 (UTC+06:00) Novosibirsk
9551 (UTC+02:00) Windhoek
9552 (UTC+05:45) Katmandu
9553 (UTC+12:00) Auckland, Wellington
9554 (UTC-03:30) Newfoundland
9555 (UTC+08:00) Irkutsk
9556 (UTC+07:00) Krasnoyarsk
9557 (UTC-04:00) Santiago
9558 (UTC-08:00) Pacific (USA, Canada)
9559 (UTC-08:00) Tijuana, Lower California (Mexico)
9560 (UTC+01:00) Brussels, Copenhagen, Madrid, Paris
9561 (UTC+03:00) Moscow, St. Petersburg, Volgograd
9562 (UTC-03:00) Buenos Aires
9563 (UTC-05:00) Bogotá, Lima, Quito
9565 (UTC-11:00) Midway Islands, Samoa
9566 (UTC+07:00) Bangkok, Hanoi, Jakarta
9567 (UTC+02:00) Harare, Pretoria
9568 (UTC+05:30) Sri Jayawardenepura

9569 (UTC+08:00) Taipei
9570 (UTC+10:00) Hobart
9571 (UTC+09:00) Osaka, Sapporo, Tokyo
9572 (UTC+13:00) Nuku'alofa
9573 (UTC-05:00) Indiana (east)
9574 (UTC-07:00) Arizona
9575 (UTC+10:00) Vladivostok
9576 (UTC+08:00) Perth
9577 (UTC+01:00) West-Central Africa
9578 (UTC+01:00) Amsterdam, Berlin, Bern, Rome, Stockholm, Vienna
9579 (UTC+05:00) Islamabad, Karachi
9580 (UTC+10:00) Guam, Port Moresby
9581 (UTC+09:00) Yakutsk
9582 (UTC+04:00) Caucasus Standard Time
9583 (UTC-06:00) Chicago, Dallas, Kansas City, Winnipeg
9584 (UTC-06:00) Guadalajara, Mexico City, Monterrey - new
9585 (UTC) Casablanca
9587 (UTC-07:00) Chihuahua, La Paz, Mazatlan - new
9588 (UTC-03:00) Montevideo
9589 (UTC+05:00) Tashkent
9591 (UTC-04:00) Georgetown, La Paz, San Juan

9.7 General Return Codes

The following table provides the most common register return codes of SMA devices. The enumeration(s) column contains the corresponding abbreviations. Due to the variety of devices, several abbreviations may be specified. In the tables of section "SMA Modbus Profile – Assignment Tables", from page 29, the return codes are assigned to the individual Modbus addresses.

Event Numbers

The event numbers provided by the devices under the Modbus address 30197 are device-specific. For their breakdown, please use the documentation of the respective device. You cannot decode the event numbers using the return codes of this section!

Return code	Meaning	Enumeration(s)
51	Closed	Cls
276	Instantaneous value	LimFst
295	MPP	Mpp, MPP, Mpp-Betrieb, Mpp-Operation
303	Off	Off
308	On	On
309	Operation	Operation
311	Open	Opn
336	Contact manufacturer	PrioA
337	Contact installer	PrioC
338	Invalid	PrioIna

381	Stop	Stop
455	Warning	Wrn, Disturbance, Stoer, Stoerung, Störung, Warning
461	SMA (manufacturer specification)	
973	Not set, NaN	NaN, ---, ----, -----, ------, -------, ---------
1041	Overexcited	OvExt, Overexcited
1042	Underexcited	UnExt, Underexcited
1069	Reactive power/Voltage characteristic Q(U)	VArCtlVol
1070	Reactive power Q, direct default setting	VArCnstNom
1071	Reactive power const. Q (kvar)	VArCnst
1072	Reactive power Q, default setting via plant control	VArCtlCom
1073	Reactive power Q(P)	VArCtlW
1074	cos(Phi), direct specification	PFCnst
1075	cos(Phi), default setting via plant control	PFCtlCom
1076	cos(Phi)(P) characteristic curve	PFCtlW
1077	Active power limitation P (W)	WCnst
1078	Active power limitation P (% Pmax)	WCnstNom
1079	Active power limitation P via plant control	WCtlCom
1387	Reactive power Q, default setting via analog input	VArCnstNomAnIn
1388	cos(Phi), default setting via analog input	PFCnstAnIn
1389	Reactive power/Voltage characteristic curve Q(U) with hysteresis and deadband	VArCtlVolHystDb
1390	Active power limitation P via analog input	WCnstNomAnIn
1391	Active power limitation P via digital inputs	WCnstNomDgIn
1392	Error	Flt
1393	Wait for PV voltage	WaitPV
1394	Wait for valid AC grid	WaitGri
1395	DC range	DcDm

1396	AC grid	Gri
1455	Emergency Stop	EvtEmgStop
1466	Waiting	Wait
1467	Starting	Str
1468	MPP search	MppSrch
1469	Shut-down	Shtdwn
1470	Fault	Dst
1471	Warning/Error mail OK	EvtWrnErrTxOk
1472	Warning/Error mail not OK	EvtWrnErrTxNok
1473	Plant information mail OK	EvtPlntDatTxOk
1474	Plant information mail not OK	EvtPlntDatTxNok
1475	Error mail OK	EvtErrTxOk
1476	Error mail not OK	EvtErrTxNok
1477	Warning mail OK	EvtWrnTxOk
1478	Warning mail not OK	EvtWrnTxNok
1479	Wait after grid interruption	GriFltMon
1480	Wait for electricity supplier	WaitUtil

10 Contact

If you have technical problems concerning our products, contact the SMA Service Line. We need the following information in order to provide you with the necessary assistance:

- Used Modbus master software or hardware
- Software version of your data logger
- Type of communication interface between the data logger and the devices
- Type, serial numbers, and software version of the devices connected to the PV plant
- If you need to send in the data logger, remove the SD card first

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www.SMA.de

SMA Service Line

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Communication:	+49 561 9522 2499
SMS with "CALL BACK" to:	+49 176 888 222 44
Fax:	+49 561 9522 4699
E-mail:	serviceline@SMA.de

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